ASSOCIATIONS OF SOCIODEMOGRAPHIC AND PSYCHOLOGICAL FACTORS WITH BINGE EATING BEHAVIOR IN A NATIONALLY REPRESENTATIVE SAMPLE OF U.S. ADOLESCENTS

by
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A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Philosophy

Baltimore, Maryland
May 2015

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ABSTRACT

Binge eating behavior in adolescents−characterized by consuming unusually large quantities of food with a sense of loss of control and distress−is a public health concern because of its significant associations with mental and physical health consequences. Most studies on eating disorders have used clinical or college samples and included mostly females. While a handful of descriptive epidemiological studies reported binge eating prevalence, we still know little about correlates of binge eating behavior in the general adolescent population. We aimed to assess sociodemographic correlates, such as gender and race/ethnicity, as well as psychological correlates, such as personality traits (neuroticism, impulsivity, and the combination of neuroticism/impulsivity) and coping styles (poor problem solving, distraction, and escape-avoidance), of binge eating behavior among adolescents, using data from the National Comorbidity Survey: Adolescent Supplement (NCS-A), a nationally representative, cross-sectional study. We found significant gender and racial/ethnic differences in lifetime prevalence and symptom presentation of binge eating. We also found significant associations among personality traits, coping styles, and binge eating: the combination of neuroticism/impulsivity and escape-avoidance in particular. Our findings on gender and racial/ethnic differences in binge eating may guide future development of prevention, screening, and treatment strategies that are sensitive to gender or cultural differences. Our findings on the associations among personality traits, coping styles, and binge eating may guide future research on etiology and intervention strategies for adolescents with binge eating issues.

Readers: Lisa Townsend, Shauna Reinblatt, and Lawrence Wissow

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ACKNOWLEDGEMENTS

I would like to thank my committee members, Tamar Mendelson, Lisa Townsend, Shauna Reinblatt, and Lawrence Wissow for their support and assistance throughout my years at Hopkins and during the dissertation process. You have all contributed to my development as a researcher and guided me to reach this point. I also would like to thank the alternates on my committee, Ramin Mojtabai, Holly Wilcox, and Alden Gross.

I would like to express my deepest gratitude to my wonderful advisor, Tamar Mendelson. Tamar has guided me with endless amounts of support and caring since my first year at Hopkins. She has always provided constructive and thoughtful feedback on my manuscripts and dissertation drafts. Tamar, I cannot thank you enough for your confidence in my abilities and your continued encouragement.

I thank my family and friends who have supported and believed in me with love. Because of them, I was able to get through the challenges I encountered during this process. I have been fortunate to be surrounded by a talented and caring group of students at Hopkins. I thank their friendship and encouragement. I am tremendously grateful to my parents and my sister for encouraging me to pursue my dreams and their unconditional support and love. I am the luckiest to have my husband who has supported my dreams with his love, trust, and patience. Luke, thank you for always being there for me with your support and love.

Finally, I dedicate this dissertation to our newborn daughter, Hanna. I love you, Hanna. Thank you for coming into my life. You are my inspiration and motivation.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

CHAPTER 1. INTRODUCTION

1.1. Problem Statement

Binge eating disorder (BED) is the most prevalent eating disorder in the general U.S. adolescent population and has significant associations with adverse consequences, constituting an important public health concern. Subthreshold binge eating disorder (SBED) is even more prevalent than BED in the general U.S. adolescent population and is associated with the development of BED and with negative mental and physical health outcomes. We know little, however, about BED or SBED in the general U.S. adolescent population. Assessing potential differences in prevalence and symptom presentation by gender and race is an important first step toward detecting potential sociodemographic disparities, with the goal of identifying vulnerable populations and developing gender- and cultural-specific interventions if indicated. Identifying psychosocial correlates of binge eating−such as personality traits and coping styles−and potential gender differences in these correlates, is also important as this may lead to detection of malleable targets for intervention efforts. Given that the age of onset for binge eating is in early adolescence, it is important to examine sociodemographic and psychosocial correlates of binge eating in this age group.

Using data from the National Comorbidity Study: Adolescent Supplement (NCS-A), this study evaluated three specific aims to advance the current understanding of binge eating in adolescence. In Aim 1, we assessed gender and racial differences in prevalence and symptom presentation of binge eating. In Aim 2, we examined personality traits−specifically neuroticism, impulsivity, and their combination−as potential correlates of binge eating. In

Aim 3, we investigated associations among the combined personality traits of neuroticism and impulsivity, coping styles, and binge eating.

1.2 Specific Aims

Aim 1. To assess gender and racial/ethnic differences in binge eating among adolescents.

Hypothesis 1.1 Females will endorse more BED symptoms associated with loss of control and distress due to binge eating.

Hypothesis 1.2 Hispanics will show higher lifetime prevalence of binge eating than non-Hispanic Whites.

We will explore adolescent race/ethnicity as a potential moderator of the gender−binge eating prevalence and BED symptoms associations.

Aim 2. To examine associations between maladaptive personality traits (neuroticism and impulsivity) and binge eating among adolescents.

Hypothesis 2.1 Neuroticism and impulsivity will each positively associated with higher lifetime prevalence of binge eating.

Hypothesis 2.2 Adolescents with high levels of both neuroticism and impulsivity will show higher lifetime prevalence of binge eating than those with low levels of both traits or high levels of only one personality trait.

We will explore adolescent gender as a potential moderator of each personality trait−binge eating association.

Aim 3. To investigate associations among the combined personality trait of neuroticism/impulsivity, coping styles, and binge eating among adolescents.

Hypothesis 3.1 Poor problem solving, distraction, and escape-avoidance coping will be positively associated with neuroticism/impulsivity and higher lifetime prevalence of binge eating.

Hypothesis 3.2 Poor problem solving, distraction, and escape-avoidance coping will moderate the associations between combined neuroticism/impulsivity and lifetime binge eating.

We will explore adolescent gender as a potential moderator of each NI−coping and coping−lifetime binge eating association.

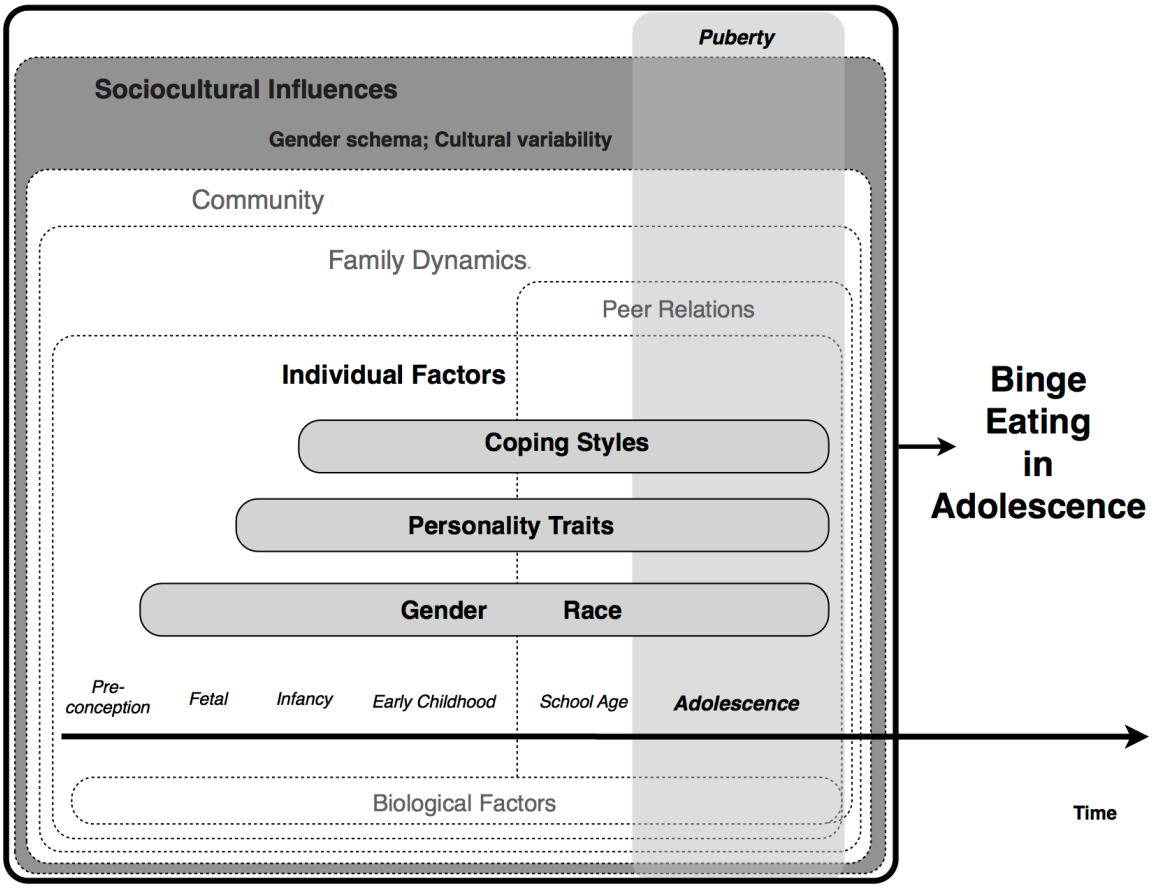
1.3. Conceptual Framework

The following theories guided the questions and approach in the proposed study.

1.3.1 A multi-level life course perspective on binge eating

The framework depicted in Figure 1 displays how we conceptualized binge eating from a multi-level life course perspective (Bronfenbrenner, 1974; Glass & McAtee, 2006). Figure 1 displays the dynamics of reciprocal interactions between an individual and her/his surroundings (i.e., bi-directional influences between and within different levels of the social ecology) and influences on development of binge eating in adolescence. Puberty is highlighted to emphasize that it is a time of increased vulnerability for eating disorders (Shapiro-Weiss & Shapiro-Weiss, 2001). Factors in bold font include 1) gender schema theory (described below), which guided certain study hypotheses and 2) personality and coping as the foci of Aims 2 and 3.

Figure 1. Conceptual framework of binge eating in adolescence from a multi-level life course perspective



1.3.2 Applying ecological systems theory to binge eating research

Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1974) emphasizes bi-directional influences between an individual and his/her surroundings. This theory proposes that an individual's life is embedded within different levels of the larger social ecology, including an immediate environment (microsystem: home/school), an extended social network (mesosystem: neighborhood/community), the broader society (exosystem: government/institutions), and the culture(s) that shape these other levels (macrosystem: beliefs/customs). The transactional nature of interactions between an individual and different

levels of context is important when considering the mental health of individuals. Ecological systems theory provided an overarching framework to guide the proposed study. For instance, the emphasis of ecological systems theory on bi-directional influences between gender and culture (see *gender schema theory* below) broadly informed our hypotheses on potential gender differences in 1) binge eating symptoms and diagnosis (Aim 1) and 2) the associations among personality, coping and binge eating (Aim 2 and 3).

1.3.3 Applying gender schema theory to binge eating research

Schema theory (Bartlett & Bartlett, 1995) posits that individuals from an early age develop organized mental processes (i.e., schematas) based on gained knowledge and experience that guide the interpretation of self and one's environment. Following this logic, Bem's gender schema theory (Bem, 1981) proposes that children learn how women and men are expected to play different roles in society and are socialized to behave differently from one another based on these internalized gender schemas.

Gender schema theory provides a rationale for investigating gender differences in symptom reporting or experience and exploring gender as a potential moderator of the association of personality and coping to binge eating. Expressing emotions, for instance, is socially accepted and generally expected of females but not males (Brody & Hall, 2008; Grossman & Wood, 1993). Females tend to perceive and report themselves as more neurotic, agreeable, and sociable than males (Weisberg, DeYoung, & Hirsh, 2011), possibly because these traits are encouraged and accepted as feminine qualities. Females also show greater tendency than males to seek emotional support from others and are more likely to ruminate when coping with stress (Ali & Toner, 1996; Tamres, Janicki, & Helgeson, 2002).

Gender schema theory highlights the transactional process between cultural beliefs about gender and internalization/expression of culturally-based expectations regarding males and females. Because gender-discordant behavior is discouraged, we speculate that male adolescents may perceive expressing distress as a "sign of weakness" (Broderick & Korteland, 2002) while female adolescents report being more neurotic and using more wishful thinking to cope with stress than male adolescents. We used gender schema theory to inform our hypotheses on potential gender differences in the diagnosis and symptom presentation of binge eating as well as in personality− and coping−binge eating associations. These potential gender schema-based differences may have implications for the future development of gender-specific intervention strategies.

1.4. Background

1.4.1 Epidemiology of binge eating in adolescence

BED is a recently recognized diagnosis in DSM5 (American Psychiatric Association, 2013), characterized as recurrent consumption of unusually large quantities of food with a sense of loss of control and marked distress due to binge eating. A recent epidemiological study reported that BED was the most prevalent eating disorder among adolescents in the general U.S. population (1.6%) (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). BED is significantly associated with negative and often long-lasting effects, such as obesity (Fairburn et al., 1998; Hudson, Hiripi, Pope, & Kessler, 2007; Swanson et al., 2011). BED is also highly comorbid with almost all major psychiatric disorders, as well as suicidality (Swanson et al., 2011).

SBED is more prevalent than BED among adolescents in the general population (2.5%) (Swanson et al., 2011) and is associated with increased risk for development of BED (Stice, Marti, Shaw, & Jaconis, 2009), as well as with increased incidence of overweight/obesity (Sonneville et al., 2013), and negative mental health outcomes (Stice et al., 2009; Swanson et al., 2011). SBED has a younger median age of onset (age 10) than BED (age 12.6 years) (Swanson et al., 2011). Binge eating behaviors that do not meet full criteria for BED, however, are less likely to gain attention from clinicians and researchers (Fairburn & Bohn, 2005; Fairburn & Cooper, 2007), despite their associations with similar levels of role impairment, emotional distress, or comorbidity (McManus & Waller, 1995; Stice et al., 2009; Swanson et al., 2011). Studying adolescents with SBED in addition to those with BED is important for better understanding a wider range of binge eating problems.

1.4.2 Adolescence as a key period for binge eating prevention efforts

Adolescence is a transitional period of increased vulnerability to various types of psychopathology (Shapiro-Weiss & Shapiro-Weiss, 2001), including binge eating (Swanson et al., 2011). A prospective study of adolescent females from community samples found that experiencing major risk factors for eating disorders (e.g., perceived pressure to be thin, thin-ideal internalization, body dissatisfaction) at age 14 was the most significant predictor of subsequent first incidence of an eating disorder (Rohde, Stice, & Marti, 2014). Adolescence is a time of rapid changes in physical, cognitive, emotional, and behavioral development (Steinberg & Morris, 2001) and is also a window of opportunity for binge eating prevention efforts. Psychological development during adolescence includes establishing cognitive and behavioral routines with potentially adaptive or harmful consequences (Wekerle, Waechter,

Leung, & Leonard, 2007). For instance, cultivating adaptive coping skills may increase youth's resilience when faced with stressors (Compas, Champion, & Reeslund, 2005). Promoting well-being during this period, therefore, could have positive implications for current and later functioning.

1.4.3 Sociodemographic correlates of binge eating among adolescents: Gender and race/ethnicity

Lifetime prevalence of BED is almost three times as high among female adolescents (2.3%) as male adolescents (0.8%), but lifetime prevalence of SBED does not differ by gender (female: 2.6%; male: 2.3%) (Swanson et al., 2011). Reasons for this pattern of gender differences in prevalence of binge eating are not yet well understood. BED studies in adults showed no gender differences in the level of clinical impairment (Striegel, Bedrosian, Wang, & Schwartz, 2012) or in the frequency or the degree of problematic eating behavior among BED patients (Barry, Grilo, & Masheb, 2002; Tanofsky, Wilfley, Spurrell, Welch, & Brownell, 1997). While male adolescents in a community-based study reported experiencing more frequent binge eating than females, they reported less loss of control, binge-eating related distress, or ever wanting treatment or having been treated for their eating problems (Lewinsohn, Seeley, Moerk, & Striegel-Moore, 2002). These findings suggest gender disparities in BED diagnosis may reflect gender differences in symptom experience or expression. Research is needed to identify whether gender differences in BED prevalence reflect differences in the frequency of binge eating behavior or, alternatively, differences in symptoms reporting of binge eating, which have different implications for screening and intervention.

Research also suggests racial/ethnic differences in prevalence of binge eating, but only a few population-based studies have studied race/ethnicity-binge eating associations. A recent descriptive epidemiological study on U.S. adolescents indicated Hispanics have higher prevalence of lifetime BED than other racial/ethnic groups, and all racial minority groups showed higher prevalence of SBED than non-Hispanic Whites (Swanson et al., 2011). State-wide surveys of disordered eating behaviors among adolescents also showed increased reports of frequent binge eating among racial minority groups, including Hispanic females (Croll, Neumark-Sztainer, Story, & Ireland, 2002). While racial minority adolescents seem to be affected by binge eating and related issues, no studies, to our knowledge, examined racial/ethnic differences in prevalence and symptoms of binge eating among adolescents or explored adolescent race/ethnicity as a potential moderator of the associations between gender and binge eating, using nationally representative data and controlling for potential confounders. These data may have implications for guiding proper screening and intervention efforts to reduce health disparities among adolescents with binge eating.

1.4.4 Psychosocial correlates of binge eating among adolescents: Personality traits

Personality traits (Lilenfeld, 2011; Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006; Cassin & von Ranson, 2005) and coping styles (Ball & Lee, 2000; Garcia, 2010) have been identified as correlates of eating disorders. Little is known, however, about the associations of these factors with binge eating among adolescents in the general population. Identifying the relations of these psychosocial factors to binge eating in the general adolescent population is important as a first step in identifying potential mechanisms

involved in the development of binge eating, as well as informing the development of effective interventions.

Personality, defined as individual characteristics that develop as individuals progress throughout their lifespan (Shiner & Caspi, 2003), was found to be strongly associated with the development of mental disorders in children and adolescents (Tackett, 2006), including eating disorders (Keel & Forney, 2013; Lilenfeld, 2011; Lilenfeld et al., 2006). Personality is considered a stable tendency of cognitive, emotional, and behavioral responses of an individual, but adaptation and expression of personality are modifiable (Krueger & Tackett, 2003; Sutin, Ferrucci, Zonderman, & Terracciano, 2011) as individuals gain the capacity and skills to regulate emotions (Shiner & Caspi, 2003; R. L. Shiner, Masten, & Tellegen, 2002). Recent research on targeting temperamental vulnerabilities such as behavioral disinhibition in children using cognitive and behavioral techniques (e.g., cognitive restructuring, social skills, coping plans) showed successful preliminary results in reducing the development of anxiety disorders among children (Kennedy, Rapee, & Edwards, 2009; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2010).

Neuroticism, defined as a predisposition towards negative emotionality, tension, and anxiety (Cassin & von Ranson, 2005; Costa & McCrae, 1992; Zuckerman, 2002), is the most frequently studied personality trait in relation to eating disorders and is considered a risk factor for eating disorders (Lilenfeld et al., 2006). Impulsivity has been defined as a tendency to act without thinking and to seek thrills and novelty (Cassin & von Ranson, 2005; Zuckerman, 2002). Impulsivity has not been examined as extensively as neuroticism in association with eating disorders (Lilenfeld, 2011). A few studies that investigated conscientiousness−a personality trait considered similar to impulsivity (Zuckerman, 2002;

Zuckerman, Michael, Joireman, Teta, & Kraft, 1993) −and eating disorders found that lower conscientiousness was more common in individuals with eating problems than those without eating problems (Ghaderi & Scott, 2000; Podar, Hannus, & Allik, 1999). The few studies that assessed impulsivity and eating disorders did not have consistent findings (Lilenfeld et al., 2006), partly due to varying conceptualizations of impulsivity across studies (Whiteside & Lynam, 2001). Research suggests negative urgency, a construct that integrates negative emotionality (i.e., neuroticism) and reckless action (i.e., impulsivity) (Fischer, Smith, & Cyders, 2008; Whiteside & Lynam, 2001), may be the most highly associated with bulimic symptom expression (Fischer et al., 2008). This finding indicates that the combination of neuroticism and impulsivity merits exploration as a potential correlate of binge eating. Assessing aspects neuroticism and impulsivity, both independently and together, and their associations with lifetime prevalence of binge eating in a nationally representative sample of adolescents may help to understand characteristics of adolescents who struggle with binge eating, paving the way for research on strategies for early identification and modification of these potentially malleable psychosocial factors.

1.4.5 Psychosocial correlates of binge eating among adolescents: Coping styles

Coping refers to cognitive and behavioral responses that individuals use to manage perceived stress (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Developmental researchers highlight the importance of establishing adaptive coping strategies during adolescence. Evidence suggests robust associations of coping with adolescents' well-being, including adjustment, school performance, physical and mental health.(Garcia, 2010; Schonert-Reichl, 2003; Sveinbjornsdottir & Thorsteinsson, 2008) The

ways adolescents cope with stress during this period can impact both their present and future well-being (Broderick & Korteland, 2002; Garcia, 2010; Schonert-Reichl, 2003).

Coping has been categorized into several types (Carver & Connor-Smith, 2010; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Skinner, Edge, Altman, & Sherwood, 2003). One common way of classifying coping is problem-focused versus emotion-focused coping (Lazarus & Folkman, 1984; Skinner et al., 2003). Problem-focused coping attempts to remove a stressor or minimize its impact and is generally linked with better adjustment and well-being, whereas emotion-focused coping focuses on reducing distress triggered by a stressor and is associated with increased distress and psychopathology (Ball & Lee, 2000; Compas et al., 2001; Ghaderi & Scott, 2000). Avoidance coping, a subset of emotion-focused coping, has been proposed as a predictor of psychopathology, including eating disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010) in non-clinical samples of female adolescents (García-Grau, Fusté, Miró, Saldaña, & Bados, 2002) and male adolescents (García-Grau, Fusté, Miró, Saldaña, & Bados, 2004). Avoidance coping was also more frequently used by binge eating adolescents than non-binge eating adolescents in Spain (Sierra Baigrie, 2008; Sierra-Baigrie, Lemos-Giráldez, Paino, & Fonseca-Pedrero, 2012). Distraction coping−a relatively new concept in coping research that refers to diverting attention by engaging in secondary behavioral or cognitive activities (Skinner et al., 2003)−was also associated with both same day and next day binge eating.(Freeman & Gil, 2004) Identifying associations between coping styles and binge eating in the general adolescent population may be an early step in work that informs the development of effective interventions focusing on promoting adaptive coping skills among adolescents.

1.4.6 Psychosocial correlates of binge eating among adolescents: Interactions between personality traits and coping styles

Coping can be considered "personality in action" (Bolger & Zuckerman, 1995) based on their strong correlations (Connor-Smith & Flachsbart, 2007) and their shared genetic basis (Kato & Pedersen, 2005). Research suggests high neuroticism or low conscientiousness is largely linked to increased use of emotion-focused coping and decreased use of problem-focused coping (Connor-Smith & Flachsbart, 2007). Significant associations between increased impulsivity/intensity seeking and the use of avoidance and distraction coping were found among young Canadian males with serious gambling issues (Nower, Derevensky, & Gupta, 2004). Another study found the direct positive effects of neuroticism and psychoticism on avoidance coping among Croatian adolescents (Kardum & Krapić, 2001). Examining personality traits and coping styles together provides a more nuanced understanding of what kinds of personality traits are linked with which types of coping. Studying personality and coping in association with binge eating may be useful in identifying potential targets for further research and intervention efforts.

Research shows that coping may moderate the associations between personality and psychopathology (Carver & Connor-Smith, 2010). For example, emotion-oriented coping was found to reduce the strength of associations between trait anxiety and disordered eating (Fitzsimmons & Bardone-Cone, 2010), whereas non-productive coping (e.g., avoidance, denial) strengthened the association between behavioral approach (e.g., reward seeking) and disordered eating (Hasking, 2006). Investigating coping as a potential moderator of the associations between personality traits and binge eating may further elucidate the role of

coping and may ultimately be informative in developing future interventions to decrease the use of maladaptive coping.

1.5. Overview of Chapters

This dissertation study used data from the National Comorbidity Survey: Adolescent Supplement (NCS-A, 2001-2004) (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009), a nationally representative, cross-sectional dataset containing information about the mental health of 10,148 adolescents aged 13 to 18 years. Nine hundred and four adolescents who resided in the household that participated in the National Comorbidity Survey Replication (Kessler & Merikangas, 2004), and 9,244 students from 320 nationally representative schools in the same communities as in the NCS-R were interviewed face-to-face (Kessler, Avenevoli, Costello, et al., 2009). The NCS-A provides prevalence estimates, correlates, and service use patterns for DSM-IV disorders.

1.5.1 Chapter 2 overview

Chapter 2 reports our findings regarding gender and racial/ethnic differences in binge eating among adolescents. Adolescent gender and race were our two independent variables of interest. Our outcomes of interest for Aim 1 included: 1) lifetime prevalence of BED and SBED and 2) endorsement of eight BED symptoms. Aim 1 examined 149 adolescents who met the criteria for lifetime BED and 256 who met criteria for lifetime SBED. The comparison group was 9,008 adolescents who did not meet criteria for either. We used

generalized linear modeling to fit regression models with a modified Poisson approach to estimate prevalence ratios (Barros & Hirakata, 2003; Zou, 2004).

1.5.2 Chapter 3 overview

Chapter 3 reports our investigation of associations between maladaptive personality traits (neuroticism, impulsivity, and the combination of neuroticism and impulsivity) and binge eating among adolescents. We studied 437 adolescents with lifetime binge eating (i.e. have experienced either lifetime BED or lifetime SBED) and compared them to 9,591 adolescents without lifetime AN, BN, BED, or SBED. Our independent variables were neuroticism, impulsivity, and the combined personality traits of neuroticism and impulsivity. Our outcome of interest was lifetime prevalence of binge eating. To asses the associations between the combined personality of neuroticism/impulsivity and lifetime binge eating, we transformed our independent variables to dichotomous variables by performing a median split and created four groups; 1) high in both neuroticism and impulsivity, 2) low in neuroticism but high in impulsivity, 3) high in neuroticism but low in impulsivity, and 4) low in both neuroticism and impulsivity. To test each hypothesis, we used generalized linear modeling to fit regression models with a modified Poisson approach to estimate prevalence ratios (Barros & Hirakata, 2003; Zou, 2004).

1.5.3 Chapter 4 overview

Chapter 4 reports our findings on associations among the combined personality of neuroticism/impulsivity, coping styles, and binge eating among adolescents. We studied 437 adolescents with lifetime binge eating (i.e. have experienced either lifetime BED or lifetime

SBED) and compared them to 9,591 adolescents without lifetime AN, BN, BED, or SBED. Our dependent variable was lifetime prevalence of binge eating. Our independent variables were the combined personality of neuroticism-impulsivity and coping styles (poor problem solving, escape-avoidance, and distancing). To test our first hypothesis, our independent variable was the combined personality trait of neuroticism and impulsivity, and our dependent variables were coping styles. Generalized linear modeling with Gaussian family and identity link was used for analyses with coping styles as our continuous outcome of interest. To test our second hypothesis, coping styles were our independent variables and lifetime prevalence of binge eating (endorsed vs. not endorsed) was our dependent variable. Generalized linear modeling with a modified Poisson approach was used for analyses with lifetime binge eating as our binary outcome of interest.

1.5.4 Chapter 5 overview

Chapter 5 summarizes the findings from each chapter, describes limitations and strengths, and discusses the public health implications of this research and directions for future studies.

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CHAPTER 2. GENDER AND RACIAL/ETHNIC DIFFERENCES IN PREVALENCE AND SYMPTOMS OF BINGE EATING IN A NATIONALLY REPRESENTATIVE SAMPLE OF ADOLESCENTS IN THE UNITED STATES

Abstract

Binge eating disorder (BED) is the most prevalent eating disorder in the U.S. adolescent population. Both BED and subclinical binge eating disorder (SBED) are associated with physical and mental health problems. Gender and racial/ethnic disparities in binge eating have been reported but have not yet been assessed in a nationally representative sample of adolescents or in relation to individual symptoms of BED. We examined gender and racial/ethnic differences in lifetime prevalence of BED and SBED and endorsement of specific BED symptoms in a nationally representative sample of U.S. adolescents. We used data from the National Comorbidity Survey: Adolescent Supplement (NCS-A: 2001-2004), a nationally representative cross-sectional study of adolescents aged 13 to 18. Females displayed 2.22 times higher lifetime BED prevalence than males (95% confidence interval [CI]: 1.22, 4.01, p=0.010), mainly because females endorsed more BED symptoms associated with loss of control and distress. Racial/ethnic minorities displayed higher lifetime SBED prevalence (Non-Hispanic Blacks: adjusted prevalence ratio [aPR]=1.80, CI=1.29, 2.51, p=0.001; Hispanics: aPR=1.57, CI=1.05, 2.36, p=0.030) and different patterns of BED symptoms than Non-Hispanic Whites. Findings suggest significant gender and racial/ethnic differences in binge eating prevalence and symptom presentation. Future work should explore reasons for these gender and racial/ethnic differences and consider these differences when determining how best to treat and prevent binge eating in adolescents.

2.1 Introduction

Adolescence is a critical period of increased vulnerability to eating disorders (Shapiro-Weiss & Shapiro-Weiss, 2001), including binge eating disorder (BED) (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Binge eating disorder (BED), a new diagnosis in DSM5 (American Psychiatric Association, 2013), is characterized as recurrent consumption of unusually large quantities of food with a sense of loss of control and marked distress. BED is significantly associated with obesity (Marcus & Wildes, 2013; D. R. Neumark-Sztainer et al., 2007; Stankovic & Potenza, 2010) and highly comorbid with almost all major psychiatric disorders (Fairburn CG et al., 1998; Hudson, Hiripi, Pope, & Kessler, 2007; Swanson et al., 2011). BED is the most prevalent eating disorder among adolescents in the U.S. general population (1.6%) (Swanson et al., 2011); compared to adults, however, youth often report fewer episodes of binge eating than are required to meet diagnostic criteria for BED, resulting in lower prevalence of full threshold BED among children and adolescents than adults (Tanofsky-Kraff, 2008). Subthreshold binge eating disorder (SBED) is an important problem in its own right, as it is associated with negative mental and physical health outcomes (Sonneville et al., 2013; Stice, Marti, Shaw, & Jaconis, 2009; Swanson et al., 2011; Tanofsky-Kraff et al., 2011). It is important that we examine the extent to which risk for both clinical and subclinical binge eating varies by gender and race/ethnicity in the general U.S. adolescent population in order to effectively design and target prevention and treatment efforts.

Epidemiological research shows lifetime BED prevalence is almost three times as high among female adolescents (2.3%) as male adolescents (0.8%) (Swanson et al., 2011). Lifetime SBED prevalence among adolescents, however, was not found to differ by gender

(female: 2.6%; male: 2.3%) (Swanson et al., 2011). Reasons for this pattern of gender differences in BED are not yet well understood. Some previous non-epidemiological studies showed that males and females with binge eating experienced similar clinical impairment (Striegel, Bedrosian, Wang, & Schwartz, 2012). Males adults (Striegel-Moore et al., 2009) and adolescents (Lewinsohn, Seeley, Moerk, & Striegel-Moore, 2002) in fact reported *more* binge eating than females; however, they were less likely than females to endorse perceived loss of control, one of the symptoms of BED (Lewinsohn et al., 2002; Striegel-Moore et al., 2009). Male adolescents also reported fewer BED symptoms related to binge eating-related distress and were less likely to report wanting treatment or having been treated for their eating problems (Lewinsohn et al., 2002). These findings suggest that gender differences in symptom reporting or the experience of binge eating may be related to lower prevalence of BED but equal prevalence of SBED among males as compared with females. Assessing potential gender differences in multiple symptoms associated with binge eating may provide more nuanced information to inform our understanding of this pattern of findings, and use of epidemiological data would provide results generalizable to the general adolescent population.

Research also suggests that prevalence of binge eating may differ by race and ethnicity. Only a few epidemiologic or community-based studies have explored the associations between race/ethnicity and BED. Descriptive epidemiological data on U.S. adolescents indicated that Hispanics had higher prevalence of lifetime BED than other racial/ethnic groups, and non-Hispanic Blacks, Hispanics, and other racial/ethnic minority group showed higher prevalence of SBED than non-Hispanic Whites (Swanson et al., 2011). State-wide surveys of disordered eating behaviors among adolescents showed that Hispanic

females most frequently reported binge eating (Croll, Neumark-Sztainer, Story, & Ireland, 2002). Binge eating appears to be a significant issue among racial/ethnic minority adolescents (Croll et al., 2002; French et al., 1997; Elliott, Tanofsky-Kraff, & Mirza, 2013; Johnson, Rohan, & Kirk, 2002; D. Neumark-Sztainer et al., 2002; Field, Colditz, & Peterson, 1997); however no studies, to the authors' knowledge, have investigated both gender and racial/ethnic differences in prevalence and symptoms of binge eating among adolescents or assessed whether gender differences in adolescent binge eating vary by race/ethnicity using nationally representative data and controlling for potential confounders. Identifying gender and racial/ethnic disparities (Kilbourne, Switzer, Hyman, Crowley-Matoka, & Fine, 2006) in binge eating is an important first step toward understanding patterns of risk for binge eating and developing gender- and cultural-specific interventions to address binge eating concerns.

This study assessed gender and racial/ethnic differences in binge eating prevalence and symptom presentation in the general population using data from the National Comorbidity Survey: Adolescent Supplement (NCS-A) (Kessler, Avenevoli, Costello, et al., 2009; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009). We investigated gender and race/ethnicity (non-Hispanic Whites, non-Hispanic Blacks, and Hispanics) with respect to: 1) lifetime prevalence of BED and SBED and 2) endorsement of eight BED symptoms. Based on past research, we hypothesized that females would endorse more BED symptoms associated with loss of control and distress due to binge eating, and that Hispanics would show higher prevalence of binge eating than non-Hispanic Whites. Because gender- or race/ethnicity-specific psychosocial, environmental, and economic factors may play a role in the development and maintenance of problematic eating (George & Franko, 2010) and these

factors may be interrelated, we further explored adolescent race/ethnicity as a potential moderator of the associations between gender and binge eating prevalence and symptoms.

2.2 Methods

2.2.1 Study Design and Participants

The NCS-A is a nationally representative, cross-sectional survey of mental health with a sample of 10,148 adolescents aged 13 to 18 years. Detailed description of the NCS-A's background, measures, and design is provided elsewhere (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009). The survey provides prevalence estimates, correlates, and service use patterns for DSM-IV disorders. We received approval to access the restricted NCS-A data from the Interuniversity Consortium for Political and Social Research and also obtained Johns Hopkins Bloomberg School of Public Health IRB approval for this study.

We excluded adolescents who met lifetime criteria for anorexia nervosa (AN: n=34) or bulimia nervosa (BN: n=86). Because this study focused on possible differences in binge eating across non-Hispanic White, non-Hispanic Black, and Hispanic adolescents, we excluded the heterogeneous 'Other' racial/ethnic category (n=615) from our analysis. Of the remaining 9,413 adolescents, 149 (1.58%) met the criteria for lifetime BED, 256 (2.72%) for lifetime SBED, and 9,008 (95.70%) did not meet criteria for either. We assessed eight BED symptoms in adolescents with BED (n=149) or SBED (n=256).

2.2.2 Measures

The NCS-A utilized a modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Üstün, 2004) administered by lay interviewers to ascertain BED diagnosis and symptoms among adolescents. The CIDI is a widely used diagnostic instrument that has exhibited good psychometric properties (Green et al., 2012; Kessler, Avenevoli, Green, et al., 2009). All items in this study were dichotomous (yes/no) responses.

Lifetime binge eating disorder (BED) The NCS-A's definitions of BED conforms to the proposed DSM5 criteria (Swanson et al., 2011). Lifetime BED was diagnosed if the respondent reported: 1) ever engaging in binge eating at least twice a week for several months or longer (i.e., recurrent binge eating; the NCS-A's stem question); 2) having one or more of four indicators of lack of control while binge eating (see symptoms below); 3) having three or more of five features associated with binge eating (specified in Appendix A); 4) showing one or more of four indicators of marked distress due to binging (see symptoms below); 5) not engaging in inappropriate compensatory behaviors such as purging; and 6) not meeting the diagnostic criteria for lifetime AN or BN (see Appendix A for details).

BED symptoms assessed included loss of control as operationalized by: 1) eating until feeling uncomfortably full; 2) binge eating when not hungry; 3) eating alone due to embarrassment about binge eating; and 4) being upset both during and after binge eating. Marked distress due to binge eating was also assessed as operationalized by: 1) being upset both during and after binge eating; 2) feeling guilty, upset, or depressed after binge eating; 3) worrying about the effects of binge eating on health, weight, or body shape; and 4) being afraid to gain weight while binge eating.

Lifetime Subthreshold Binge Eating Disorder (SBED) The NCS-A's definition of lifetime SBED included the following: 1) ever engaged in binge eating at least twice a week for several months or longer in lifetime; 2) one or more out of four indicators of lack of control; and 3) did not meet diagnostic criteria for AN, BN, or BED. The difference between BED and SBED is that BED includes several additional features of binge eating and also includes marked distress due to binging (i.e., lifetime BED criteria #3 and #4).

Endorsement of eight symptoms of binge eating disorder The NCS-A's structured interview assessed eight BED symptoms for all adolescents with recurrent binge eating.

2.2.3 Statistical Analyses

We calculated descriptive statistics for each demographic variable (age, education, gender, and race/ethnicity) and their relations to our dependent variables of interest (lifetime prevalence of BED and SBED, and eight BED symptoms) using weighted Chi-square tests and checked for distribution normality. We used generalized linear modeling to fit regression models with a modified Poisson approach to estimate adjusted prevalence ratios (Barros & Hirakata, 2003; Zou, 2004). Adolescent gender and race/ethnicity were our two independent variables of interest. We first performed unadjusted analyses. For analyses on gender differences, we controlled for age, education, race/ethnicity, and depression, and for analyses on racial/ethnic differences, we controlled for age, education, gender, and depression. We then adjusted for adolescents' age, education, and race/ethnicity in our models as these variables were associated with eating disorders in previous studies (Hudson et al., 2007; Marques et al., 2011; Swanson et al., 2011; Thompson-Brenner et al., 2013). Other sociodemographic correlates (parental education, parental marital status, household income,

and urbanicity) were not associated with any eating disorders in the NCS-A (Swanson et al., 2011), and thus they were not included in the models. Finally, we adjusted for experiencing lifetime major depressive disorder (MDD) in addition to age, education and race/ethnicity in our models since depression is more prevalent in female adolescents (Merikangas et al., 2010) and Hispanic youth (Anderson & Mayes, 2010; Twenge & Nolen-Hoeksema, 2002) and is associated with binge eating (Swanson et al., 2011).

To assess adolescent race/ethnicity as a potential moderator of the gender−binge eating relationships, we created an interaction term between gender and race/ethnicity (gender x race/ethnicity) and entered the relevant term into eleven regression models (i.e., models for lifetime prevalence of BED and SBED, and eight BED symptoms). If the coefficient for an interaction term was significant, we planned to conduct race/ethnicity-stratified analyses to identify how the gender−binge eating relationships differed across three racial/ethnic groups.

Listwise deletion by default was used to handle missing data since less than 2% of responses in this study were missing. To account for the sampling method of the NCS-A, we followed the NCS-A guideline and applied complex survey weights with proper variables for the survey's clustering and stratification prior to all our analyses. Statistical significance was set at p-values less than 0.05. All analyses were performed using Stata12 (StataCorp, 2011).

2.3 Results

2.3.1 Sample Characteristics

Table 1 displays the participants' demographic information. The BED group was different than the comparison group with regard to gender (χ^2=29.70, p=0.002), whereas the

SBED group was different than the comparison group with regard to race/ethnicity (χ^2=16.14, p=0.002). Age and education did not differ by binge eating status (see Table 1).

2.3.2 Lifetime Prevalence of BED and SBED

For the analysis of gender differences, our final regression models adjusted for age, education, race/ethnicity, and lifetime MDD. Lifetime prevalence of BED was 2.22 times higher in females than males (CI=1.22, 4.01, p=0.010) in our adjusted model. No gender differences in lifetime prevalence of SBED (adjusted prevalence ratio [aPR]=0.84, CI=0.53, 1.33, p=0.441) were found. Race/ethnicity did not moderate the associations between gender and lifetime BED (β=1.99, CI=0.98, 4.01, p=0.055) or SBED (β=1.12, CI=0.72, 1.75, p=0.603).

For the analysis of racial/ethnic differences, our final regression models adjusted for age, education, gender, and lifetime MDD. We did not find racial/ethnic differences in lifetime prevalence of BED. Lifetime prevalence of SBED was 1.80 times higher in non-Hispanic Blacks (CI=1.29, 2.51, p=0.001) and 1.57 times higher in Hispanics (CI=1.05, 2.36, p=0.030) than non-Hispanic Whites, in our adjusted model (see Table 2).

2.3.3 Endorsement of BED Symptoms

There were no gender differences in responses to the stem question assessing prevalence of recurrent binge eating (i.e., ever engaging in binge eating at least twice a week for several months or longer) (aPR=1.19,CI=0.78, 1.80 p=0.415). Compared to males, however, females reported more indicators of loss of control (‘eat when not hungry’ [aPR=1.16, CI=1.01, 1.34, p=0.046] and ‘upset both during and after binge eating’

[aPR=2.24, CI=1.35, 3.74, p=0.003]) and marked distress due to binge eating ('upset both during and after binge eating' [aPR=2.24, CI=1.35, 3.74, p=0.003], 'feel guilty, upset, or depressed after binge eating' [aPR=2.51, CI=1.43, 4.39, p=0.002], 'worry about binge eating effects on health, weight, or body shape' [aPR=2.01, CI=1.41, 2.88, p<0.001], and 'afraid of weight gain while binge eating' [aPR=3.31, CI=2.46, 4.46, p<0.001]) in our adjusted model (see Table 3). Race/ethnicity did not moderate the associations between gender and eight BED symptoms.

Non-Hispanic Blacks and Hispanics showed higher prevalence of recurrent binge eating than non-Hispanic Whites in our adjusted model (aPR=1.51, CI=1.10, 2.07, p=0.013 and aPR=1.61, CI=1.13, 2.30, p=0.010, respectively). Compared to non-Hispanic Whites, non-Hispanic Blacks showed 0.48 times lower prevalence of 'feeling guilty, upset, or depressed after binge eating' (CI=0.23, 0.98, p=0.045) and 0.59 times lower prevalence of being 'afraid of weight gain while binge eating' (CI=0.40, 0.87, p=0.010) in our adjusted model. Compared to non-Hispanic Whites, Hispanics reported being more 'upset both during and after binge eating' (aPR=1.45, CI=1.01, 2.09, p=0.044) in our adjusted model; whereas, compared to non-Hispanic Blacks, Hispanics reported being more 'afraid of weight gain while binge eating' (aPR=2.07, CI=1.30, 3.31, p=0.003) in our adjusted model (See Table 3).

2.4 Discussion

We found that while females showed higher BED prevalence than males, there were no gender differences in SBED prevalence when adjusting for potential confounders, including lifetime MDD. As hypothesized, females reported more symptoms associated with loss of control and distress due to binge eating than males. We also found racial/ethnic

differences in lifetime prevalence of SBED but not BED. As we expected based on past research (Croll et al., 2002; Field et al., 1997; D. Neumark-Sztainer et al., 2002), Hispanic youth showed higher lifetime prevalence of SBED than their Non-Hispanic White counterparts. Non-Hispanic Black youth also showed higher lifetime SBED prevalence than Non-Hispanic White youth. While non-Hispanic Blacks reported less distress due to binge eating than non-Hispanic Whites, Hispanics reported more loss of control and distress than non-Hispanic Whites or non-Hispanic Blacks. Race/ethnicity did not moderate the gender−binge eating prevalence or gender−BED symptom associations.

Our findings support prior studies that reported no gender differences in the frequency or the degree of problematic eating behavior (Barry, Grilo, & Masheb, 2002; Tanofsky, Wilfley, Spurrell, Welch, & Brownell, 1997) but found that females were more likely than males to endorse symptoms related to loss of control or distress due to binge eating (Lewinsohn et al., 2002; Striegel-Moore et al., 2009). These findings suggest that males may experience and/or interpret binge eating differently than females, but they do not necessarily engage in less binge eating behavior (Striegel-Moore & Franko, 2003). There are several different possible explanations for gender differences in reporting of BED symptoms related to loss of control and distress. From a sociocultural perspective, males may under-report binge eating-related distress or loss of control because expressing emotions is socially accepted and expected from females but discouraged in males (Bem, 1981), for whom it may feel like a "sign of weakness" (Broderick & Korteland, 2002). Following similar logic, perhaps females over-report loss of control or distress. A traditional view of problematic eating as a 'female issue' (Striegel-Moore, Silberstein, & Rodin, 1986) may further hinder male adolescents from reporting binge eating symptoms or may influence males not to view

binge eating as a problematic or distressing behavior (Tanofsky et al., 1997). Future investigations incorporating qualitative approaches to assess both genders' perspectives on binge eating may clarify gender differences in symptom reporting and help guide clinicians to formulate tailored treatment plans.

While we did not find significant racial/ethnic or ethnic differences in lifetime BED prevalence, racial/ethnic minorities showed higher lifetime SBED prevalence than non-Hispanic Whites. These findings highlight that binge eating behaviors are a concern in racial/ethnic minority adolescents and suggest the need for health professionals to screen minority adolescents for these behaviors.

As compared with non-Hispanic Whites, non-Hispanic Blacks and Hispanics showed different patterns of BED symptoms of loss of control or distress as non-Hispanic Blacks reported less distress while Hispanics reported more loss of control and distress. We speculate that racial/ethnic differences in BED symptom presentation may be a result of cultural differences in experience and/or reporting of binge eating. Future research providing insight into these variations may enhance our understanding of the role of cultural factors in development and maintenance of problematic eating behaviors. Currently, few culturally appropriate screening tools or treatments exist for racial/ethnic minorities with eating disorders (Lester, 2007). Our findings highlight the importance of recognizing variability in BED symptoms across gender and racial/ethnic groups for tailored prevention and treatment strategies that could address appropriate needs and issues of adolescents with binge eating.

Binge eating has a strong association with childhood obesity (Marcus & Wildes, 2013; Stankovic & Potenza, 2010), which may put children and adolescents at greater risk for serious health issues (Han, Lawlor, & Kimm, 2010; Stankovic & Potenza, 2010; Stewart,

2011), including cardiovascular disease and Type II diabetes and obesity in adulthood (Singh, Mulder, Twisk, Van Mechelen, & Chinapaw, 2008; Stewart, 2011). The prevalence of obesity in 2011-2012 was higher in non-Hispanic Black and Hispanic youth than non-Hispanic White youth but showed no gender differences (Ogden, Carroll, Kit, & Flegal, 2014). A trend analysis, however, revealed that male children and adolescents, particularly non-Hispanic Black males, showed a significant increase in obesity prevalence over the last decade (between 1999-2000 and 2009-2010), whereas no significant changes in these measures among females or other racial/ethnic groups were found (Ogden, Carroll, Kit, & Flegal, 2012). Given the significant associations between binge eating and obesity, these findings highlight the need to explore how to best promote healthy behavior and attitudes towards eating in racial/ethnic minority groups, particularly non-Hispanic Black male adolescents, to prevent increases in obesity prevalence.

This study has several limitations. First, the NCS-A survey was conducted in 2001-2004; different results may be obtained if the study was conducted in more recent years. Second, the NCS-A used layperson interviews to gather information from adolescents, as interviews administered by a clinician are generally not feasible for a population-based survey. The CIDI, however, is a widely used measure and has good concordance with clinician diagnoses (Kessler, Avenevoli, Green, et al., 2009). Third, as information on the body mass index of adolescents was not collected, we could not assess its association with binge eating. Fourth, as the NCS-A stem question specified frequency (at least twice a week) and duration (for several months or longer) of binge eating, we were unable to assess binge eating behaviors in adolescents who binged less frequently or for a shorter period. Lastly, the NCS-A did not contain adequate information on which racial/ethnic groups comprised the

"Other" category, which we excluded from our analyses. Future national surveys should attempt to include individuals from other racial/ethnic minority groups, such as Native Americans and Asians, as well as specific ethnic subgroups (e.g., Korean, Thai, Indian, etc.)

Despite these limitations, our use of data from a nationally representative sample enhances study generalizability, and findings of this study extend current knowledge regarding gender and racial/ethnic differences in binge eating among adolescents. Binge eating deserves clinical attention due to its negative and often long-lasting consequences. Identification of gender and racial/ethnic differences in adolescent binge eating has potential to inform proper screening and intervention practices that promote healthy eating.

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Table 2.1 Participant characteristics with lifetime BED or SBED in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

Characteristics	Lifetime BED (n=149)	Lifetime SBED (n=256)	Comparison Group[a] (n=9,008)
Gender (n, %)			
Female	106 (71.14)	118 (46.09)	4,543 (50.43)
Male (=ref.)	43 (28.86)	138 (53.91)	4,465 (49.57)
Race/Ethnicity (n, %)			
Non-Hispanic Black	34 (22.82)	78 (30.47)	1,821 (20.22)
Hispanic	34 (22.82)	58 (22.66)	1,794 (19.92)
Non-Hispanic White (=ref.)	81 (54.36)	120 (46.88)	5,393 (59.87)
Age (mean±SD)	15.55±1.49	15.32±1.56	15.17±1.50
Education[b] (mean±SD)	9.02±1.57	8.87±1.58	8.75±1.59

BED=binge eating disorder; SBED=subthreshold binge eating disorder; ref.=reference; SD= standard deviation

[a]Adolescents without lifetime AN, BN, BED, or SBED

[b]Missing data on education: lifetime BED (n=1); lifetime SBED (n=3); comparison group (n=26)

Note. Weighted Chi-square tests were conducted to compare sociodemographic characteristics of participants with lifetime BED and SBED to the comparison group.

Table 2.2 Gender and racial differences in with lifetime prevalence of BED or SBED in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

	Adjusted Prevalence Ratio[†] (95% Confidence Interval)	
	Lifetime Binge Eating Disorder	Lifetime Subthreshold Binge Eating Disorder
Gender		
Female	2.22[*]	0.84
vs. Male (=ref.)	(1.22, 4.01)	(0.53, 1.33)
Race/Ethnicity		
Non-Hispanic Black	1.10	1.80[**]
vs. Non-Hispanic White (=ref.)	(0.53, 2.28)	(1.29, 2.51)
Hispanic	1.73	1.57[*]
vs. Non-Hispanic White (=ref.)	(0.76, 3.92)	(1.05, 2.36)
Hispanic	1.57	0.87
vs. Non-Hispanic Black (=ref.)	(0.64, 3.85)	(0.60, 1.27)

BED=binge eating disorder; SBED=subthreshold binge eating disorder; ref.=reference
[†]For analyses on gender, we adjusted for adolescents' race/ethnicity, age, education, and lifetime major depressive disorder. For analyses on race/ethnicity, we adjusted for adolescents' gender, age, education, and lifetime major depressive disorder.
[*]$p<0.05$; [**]$p<0.01$

Table 2.3 Gender and racial differences in endorsement of binge eating disorder BED symptoms in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

	Adjusted Prevalence Ratio (95% Confidence Interval)							
		Loss of Control			Marked Distress			
	Eat too quickly	Eat until uncomforta -bly full	Eat when not hungry	Eat alone because embarrassed	Upset both during and after binge eating[a]	Feel guilty, upset, or depressed after binge eating	Worry about binge eating effects on health, weight, or body shape	Afraid of weight gain while binge eating
Sex								
Female vs. Male (=ref.)	0.82 (0.64, 1.05)	0.84 (0.71, 1.01)	1.16* (1.01, 1.34)	1.77 (0.96, 3.26)	2.24** (1.35, 3.74)	2.51** (1.43, 4.39)	2.01*** (1.41, 2.88)	3.31*** (2.46, 4.46)
Race/Ethnicity								
Non-Hispanic Black vs. Non-Hispanic White (=ref.)	0.95 (0.70, 1.30)	0.88 (0.75, 1.03)	1.01 (0.86, 1.18)	0.90 (0.46, 1.76)	0.97 (0.52 1.83)	0.48* (0.23, 0.98)	0.96 (0.61, 1.51)	0.59* (0.40, 0.87)
Hispanic vs. Non-Hispanic White (=ref.)	0.96 (0.64, 1.43)	0.96 (0.74, 1.26)	0.95 (0.74, 1.22)	1.42 (0.81, 2.48)	1.45* (1.01, 2.09)	0.90 (0.59, 1.37)	1.15 (0.83, 1.59)	1.22 (0.94, 1.60)
Hispanic vs. Non-Hispanic Black (=ref.)	1.00 (0.62, 1.62)	1.09 (0.83, 1.41)	0.94 (0.71, 1.25)	1.57 (0.77, 3.22)	1.49 (0.87, 2.55)	1.87 (0.86, 4.07)	1.20 (0.80, 1.80)	2.07** (1.30, 3.31)

BED=binge eating disorder; ref.=reference

[a]Indicator of both loss of control and marked distress because of binge eating

*p<0.05, **p<0.01, ***p<0.00

CHAPTER 3. ASSOCIATIONS OF NEUROTICISM AND IMPULSIVITY WITH BINGE EATING IN A NATIONALY REPRESENTATIVE SAMPLE OF ADOLESCENTS IN THE UNITED STATES

Abstract

Binge eating behavior is a public health concern with serious physical and mental health consequences. Certain personality traits have been found to contribute to the development of eating disorders in youth, but little is known about associations between personality traits and binge eating in the general adolescent population. We examined the associations of neuroticism and impulsivity−both independently and in combination−with lifetime prevalence of binge eating, using nationally representative, cross-sectional data from the National Comorbidity Survey: Adolescent Supplement (n=437). Neuroticism and impulsivity were each significantly associated with lifetime prevalence of binge eating (adjusted prevalence ratio [aPR]=1.11, confidence interval [CI]=1.07, 1.15, $p<0.001$; aPR=1.06, CI=1.04, 1.09, $p<0.001$, respectively). The combination of high neuroticism and high impulsivity was also associated with higher lifetime binge eating than the combination of low neuroticism and low impulsivity (aPR=3.72, CI=2.45, 5.65, $p<0.001$), and this association was stronger for female than male adolescents (females: aPR=5.37, CI=3.24, 8.91, $p<0.001$ vs. males: aPR=2.45, CI=1.43, 4.22, $p=0.002$). Our findings have implications for informing theories of etiology and helping to develop future interventions to target binge eating.

3.1 Introduction

Binge eating disorder (BED) is a public health concern (Austin, 2012; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011), as it is the most prevalent eating disorder in adolescents (Swanson et al., 2011) and adults (Hudson, Hiripi, Pope, & Kessler, 2007) in the general U.S. population and has physical and mental health consequences, including obesity(Marcus & Wildes, 2013; Neumark-Sztainer et al., 2007; Stankovic & Potenza, 2010) and comorbidity with many psychiatric disorders (Fairburn et al., 1998; Hudson et al., 2007; Swanson et al., 2011). BED, newly included as a diagnostic category in DSM5 (American Psychiatric Association, 2013), is characterized by recurrent episodes of eating unusually large quantities of food accompanied by a feeling of loss of control and distress. Subthreshhold binge eating (SBED) that does not meet full BED diagnostic criteria is also important because it is more prevalent than BED among adolescents in the general population (Swanson et al., 2011), significantly associated with development of BED (Stice, Marti, Shaw, & Jaconis, 2009), and increases risk for negative mental and physical health outcomes (Sonneville et al., 2013; Stice et al., 2009; Swanson et al., 2011). We know little about associations of BED or SBED with psychosocial correlates, such as personality traits, in the general adolescent population. Research suggests adolescence is a common period of BED onset (Stice et al., 2009); assessing psychosocial correlates of binge eating in this age group may be a useful first step in identifying modifiable risk factors for binge eating that can inform prevention efforts.

Personality, defined as a stable tendency of an individual's cognitive, emotional, and behavioral responses that develop over the lifespan (Shiner & Caspi, 2003), is strongly associated with the development of mental disorders in children and adolescents (Tackett,

2006), including eating disorders (Keel & Forney, 2013; Lilenfeld, 2011; Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006). There is a large literature on the conceptualization and assessment of personality traits (Andersen & Bienvenu, 2011; Widiger, 2011). Personality researchers from different theoretical backgrounds have developed systems for classifying core dimensions of personality and temperament to facilitate the study of personality and psychopathology (Andersen & Bienvenu, 2011). The most widely accepted and studied models of personality are the Five Factor Model (FFM) by Costa and McCrae (conscientiousness, agreeableness, neuroticism, openness, and extraversion) (Costa & McCrae, 1992) and the Three Factor Model by Eysenck (neuroticism, extraversion, and psychoticism) (Eysenck, Eysenck, & Barrett, 1985). An alternative model by Zuckerman and colleagues includes neuroticism-anxiety (neuroticism in the FFM and Eysenck's model), impulsive-sensation seeking (conscientiousness in the FFM and psychoticism in Eysenck's model), aggression-hostility (agreeableness in the FFM), and sociability and activity (extraversion in the FFM and Eysenck's model) (Zuckerman, 2002; Zuckerman, Michael, Joireman, Teta, & Kraft, 1993).

Problematic eating behavior (Macht & Simons, 2000; Polivy & Herman, 2002), including binge eating, often occurs in response to experiencing negative emotions (Munsch, Meyer, Quartier, & Wilhelm, 2012; Stein et al., 2007; Stice et al., 2001). Both neuroticism and impulsivity each reflect a propensity to experience and to express negative emotions (Carver, 2004; Davis-Becker, Peterson, & Fischer, 2014; R. Shiner & Caspi, 2003). Evidence suggests neuroticism−a predisposition towards negative emotionality, tension, and anxiety (Cassin & von Ranson, 2005; Costa & McCrae, 1992; Zuckerman, 2002)−has robust associations with a variety of both physical and mental health issues, including eating

disorders (Lahey, 2009). Neuroticism is a frequently studied personality trait in relation to eating disorders (Lilenfeld et al., 2006). Evidence from prospective studies supports neuroticism as a risk factor for eating disorders, including anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (Lilenfeld et al., 2006). It has been proposed that binge eating behavior may provide relief from intense and prolonged unpleasant emotional states (Heatherton & Baumeister, 1991), which individuals with elevated neuroticism tend to experience (Izydorczyk, 2012).

Impulsivity is generally defined as a tendency to act without thinking or a need for thrills and novelty (Cassin & von Ranson, 2005; Costa & McCrae, 1992; Zuckerman, 2002). Impulsivity has not yet been rigorously assessed in relation to binge eating in longitudinal studies, and operationalization of impulsivity varies across studies (Lilenfeld, 2011; Waxman, 2009). Studies have found significant associations between impulsivity and eating disorders that involve purging behavior (Fedorowicz et al., 2007; Lilenfeld, 2011); however impulsivity has not been examined as extensively in association with binge eating without purging behavior. Impulsivity has been linked with loss of control eating, a type of binge eating in children characterized by disinhibition and lack of capacity to control food intake (Tanofsky-Kraff et al., 2011), has been linked to increased impulsivity (Hartmann, Czaja, Rief, & Hilbert, 2010). Research suggests individuals with elevated impulsivity are more likely to binge eat because of their tendency to engage in reckless actions under distress (Fischer, Smith, & Cyders, 2008a; Waxman, 2009).

Research to date on personality and binge eating has a number of limitations. Research has focused primarily on binge eating among adult female clinical or college samples (Cassin & von Ranson, 2005; Lilenfeld, 2011; Lilenfeld et al., 2006) as a subtype of

AN or BN (American Psychiatric Association, 1994). Little is known about associations between personality traits and binge eating in the general population, particularly in youth. No studies, to the authors' knowledge, have investigated neuroticism or impulsivity as potential correlates of binge eating in a nationally representative adolescent sample.

The combination of neuroticism and impulsivity has also not yet been examined as a correlate of binge eating behavior. The construct of *negative urgency*−characterized by high neuroticism and associated with emotion-driven impulsive behavior (Settles et al., 2012)−integrates negative emotionality (i.e., neuroticism) and reckless action (i.e., impulsivity) (Fischer, Smith, & Cyders, 2008b; Whiteside & Lynam, 2001). A recent meta-analysis reported negative urgency as the most relevant facet of impulsivity with respect to bulimic symptom expression (Fischer et al., 2008b). Negative urgency was also significantly linked to binge eating in preadolescents (Combs, Pearson, & Smith, 2011; Fischer, Settles, Collins, Gunn, & Smith, 2012; Pearson, Combs, & Smith, 2010). These findings suggest that the combination of neuroticism and impulsivity merits exploration in relation to binge eating in adolescents more generally.

Evidence also suggests that the associations between personality traits and psychopathology may differ between females and males (Tackett, 2006). For example, negative urgency was significantly associated with eating pathology in female but not in male college students (Davis-Becker et al., 2014). No studies assessed gender differences in the associations between personality traits and binge eating in the general adolescent population.

We used data from the National Comorbidity Survey: Adolescent Supplement (NCS-A) (Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009) to examine associations

between maladaptive personality traits and binge eating in a nationally representative sample of U.S. adolescents. We hypothesized that neuroticism and impulsivity would each be associated with increased lifetime prevalence of binge eating. We also hypothesized that adolescents with high levels of both neuroticism and impulsivity (NI) would show higher lifetime prevalence of binge eating than those with low levels of both traits or high levels of only one trait. We also explored adolescent gender as a potential moderator of each personality trait−binge eating association.

3.2 Methods

3.2.1 Study Design and Participants

We used data from the NCS-A (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009), a nationally representative, cross-sectional dataset that contains information such as prevalence estimates, correlates, and service use patterns for major psychiatric disorders in a U.S. sample of 10,148 adolescents aged 13 to 18 years. Detailed description of the NCS-A's background, measures, and design is provided elsewhere (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009). We received authorization to access the restricted NCS-A data from the Interuniversity Consortium for Political and Social Research and also obtained Johns Hopkins Bloomberg School of Public Health IRB approval for this study.

We studied 437 adolescents with lifetime binge eating behavior (i.e. either lifetime BED or lifetime SBED) and compared them to 9,591 adolescents without eating issues (i.e., no diagnoses of lifetime AN, BN, BED, or SBED).

3.2.2 Measures

A modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Üstün, 2004) was used in the NCS-A, administered by lay interviewers who assessed BED symptoms and diagnosis among adolescents. The CIDI is a widely used diagnostic instrument that has exhibited good psychometric properties (Green et al., 2012; Kessler, Avenevoli, Green, et al., 2009). All items related to binge eating in this study had dichotomous (yes or no) responses. For the purpose of the current study, we combined adolescents with lifetime BED (n=162) and adolescents with lifetime subthreshold binge eating disorder (n=275) and grouped them together as 'adolescents with lifetime binge eating' (n=437). We selected this categorization in order to capture a wider range of adolescents with binge eating behavior, since few children and adolescents meet full criteria for BED (Shomaker, Tanofsky-Kraff, & Yanovski, 2011), and subthreshold symptoms are a serious issue in their own right based on SBED's link to negative health consequences (Sonneville et al., 2013; Stice et al., 2009; Swanson et al., 2011).

Lifetime binge eating disorder (BED) The NCS-A's definitions of BED were similar to the proposed DSM5 criteria.(Swanson et al., 2011) Adolescents were considered to have had lifetime BED if they reported: 1) ever engaging in binge eating at least twice a week for three months or longer; 2) having one or more out of four indicators of a sense of lack of control while binge eating; 3) having three or more out of five features associated with binge eating; 4) having one or more out of four indicators of marked distress due to binge eating; 5) not engaging in inappropriate compensatory behaviors such as purging; and 6) not meeting the diagnostic criteria for lifetime AN or BN (see Appendix A for details).

Lifetime Subthreshold Binge Eating Disorder (SBED) According to the NCS-A, Lifetime SBED was characterized by the following: 1) ever engaged in binge eating at least two days a week for three months or longer; 2) with one or more out of four indicators of a sense of lack of control; and 3) does not meet diagnostic criteria for AN, BN, or BED. The major difference between BED and SBED is that SBED does not require several additional features of binge eating and marked distress due to binge eating (see Appendix B for details).

Personality The NCS-A assessed adolescents' personality with thirty-two self-report items that were adapted primarily from the *Zuckerman Kuhlman Personality Questionnaire* (ZKPQ) (Zuckerman et al., 1993). The ZKPQ measures five different personality types: 1) *neuroticism-anxiety*: emotional upset, fearfulness, lack of self-confidence; 2) *impulsivity-sensation seeking*: lack of planning, acting impulsively without thinking, need for thrills, excitement, unpredictable situations, and novelty; 3) *aggression-hostility*: readiness to express aggression, rude behavior, quick temper; 4) *activity*: the need for activity, restlessness when there is no activity, a preference for challenging work that requires a lot of energy, and 5) *sociability*: a preference for big parties and social interactions, intolerance for social isolation. The ZKPQ has a good test/retest reliability (neuroticism-anxiety=0.84, impulsivity-sensation seeking=0.80, aggression-hostility=0.78, activity=0.76, sociability=0.83) and good convergent and discriminant validity (Zuckerman, 2002) when compared with the Revised NEO Personality Inventory (NEO-PI-R) (Zuckerman et al., 1993) and the Revised Eysenck Personality Questionnaire (EPQ-R) (Eysenck et al., 1985). In this study, we used only the neuroticism and impulsivity scales. Sample questions included "I often feel uncomfortable and uneasy for no reason" for the neuroticism scale, and "I often do things without thinking of the consequences" for the impulsivity scale.

We conducted an exploratory factor analysis (EFA) to explore the factor structure of the instrument in our sample because the NCS-A's personality questionnaire is an adapted version of the ZKPQ. EFA with polychoric correlations for categorical items was performed since responses on the measures of personality were coded on a four-point Likert-like scale (a lot, some, a little, not at all). We discarded two items that either had loadings lower than 0.40 and uniqueness higher than 0.80 or cross-loaded on more than one factor from the analysis. Remaining items fit the ZKPQ's structure as we identified three factors: neuroticism (7 items), lack of planning (3 items), and sensation seeking (7 items). No gender variances were found in the factor structure. We combined the lack of planning and sensation seeking factors to constitute the impulsivity scale, following the ZKPQ's impulsivity-sensation seeking. The neuroticism scale ranged from 0 to 21 and the impulsivity scale ranged from 0 to 30. Internal consistencies of each scale were good (Cronbach's alpha for neuroticism=0.80; impulsivity=0.74). Similar to the existing literature (Eysenck & Eysenck, 1977), the neuroticism scale showed weak positive correlations with the impulsivity scale (r=0.14).

3.2.3 Statistical Analyses

Preliminary analyses included calculating descriptive statistics for each demographic variable (age, education, gender, and race) and their associations with personality traits and lifetime prevalence of binge eating using weighted Chi-square, checking for normality of distributions.

For our primary analyses, we used generalized linear modeling with a modified Poisson approach to calculate adjusted prevalence ratios (Barros & Hirakata, 2003; Zou,

2004). Lifetime prevalence of binge eating (endorsed vs. not endorsed) was our dependent variable of interest, and personality traits (neuroticism and impulsivity, both independently and in combination) were our independent variables of interest. For the combined neuroticism and impulsivity analyses, we created three groups by performing a median split; 1) high in both neuroticism and impulsivity, 2) low in neuroticism but high in impulsivity, 3) high in neuroticism but low in impulsivity. We compared these three groups to the group low in both neuroticism and impulsivity. We first conducted unadjusted analyses and then analyses adjusted for adolescents' age, education, gender, and race, as these variables were associated with eating disorders in previous studies (Hudson et al., 2007; Marques et al., 2011; Swanson et al., 2011; Thompson-Brenner et al., 2013). Other key sociodemographic correlates that were not associated with any eating disorders in the NCS-A (Swanson et al., 2011) were not adjusted in our models.

To assess adolescent gender as a potential moderator of the personality−binge eating relationship, we created an interaction term between each personality trait and gender and entered the relevant terms into two regression models (i.e., two models for two personality traits each predicting one binge eating measure). We also created an interaction term between each combined personality trait and gender and entered the relevant terms into three regression models (i.e. three models for three types of combined personality traits predicting one binge eating measure). We planned to conduct gender-stratified analyses if the coefficient for an interaction term was significant to identify how the personality−binge eating relationship may differ between female and male adolescents.

Listwise deletion by default was used to handle missing data since less than 2% of responses in this study were missing. To account for the sampling method of the NCS-A,

complex survey weights were applied prior to all analyses. Statistical significance was set at p-values less than 0.05. All analyses were performed using Stata12 (StataCorp, 2011).

3.3 Results

3.3.1 Sample Characteristics

Participant demographic information is displayed in Table 1. The lifetime binge eating group was different than the comparison group with regard to race with a greater proportion of non-White adolescents represented in the binge eating group (χ^2=20.32, p=0.003). Gender, age, and education did not differ between two groups (see Table 1).

The increased neuroticism group (χ^2=349.64, p<0.001), the increased impulsivity group (χ^2=148.14, p<0.001), and the increased combined neuroticism-impulsivity group (χ^2=20.62, p<0.05) were different from the comparison group with regard to gender, with a greater proportion of females in the increased neuroticism and the increased combined neuroticism-impulsivity group but a greater proportion of males in the increased impulsivity group. The increased impulsivity group was different from the comparison group with regard to race (χ^2=30.39, p<0.001) with a greater proportion of Whites in the increased impulsivity group. Age and education did not differ by status of all three personality traits.

3.3.2 Association of Independent Personality Traits and Lifetime Binge Eating

Lifetime prevalence of binge eating was times 1.11 higher with increased neuroticism (confidence interval [CI]=1.07, 1.15, p<0.001) and was 1.06 times higher with increased impulsivity (CI=1.04, 1.09, p<0.001). Interaction tests revealed no moderation by adolescent gender of the associations between each personality trait and lifetime binge eating.

3.3.3 Association of Combined Personality Traits and Lifetime Binge Eating

Lifetime prevalence of binge eating was 3.72 times higher among adolescents with high NI than those with low NI (CI=2.45, 5.65, p<0.001). Lifetime prevalence of binge eating was 1.40 times higher among adolescents with high NI than those with high in neuroticism but low in impulsivity (CI=1.10, 1.77, p=0.006). No differences in lifetime prevalence of binge eating were found between adolescents with high NI and those with low neuroticism but high impulsivity (aPR=1.44, CI=0.88, 2.33, p=0.140).

Gender was a significant moderator of the associations between NI (high vs. low) and lifetime binge eating (β=2.23, CI=1.08, 4.60, p=0.031); this association was stronger for females (adjusted prevalence ratio [aPR]=5.37, CI=3.24, 8.91, p<0.001) than males (aPR=2.45, CI=1.43, 4.22, p=0.002).

3.4 Discussion

The goal of this study was to assess the associations among neuroticism and impulsivity with lifetime prevalence of binge eating in a nationally representative sample of adolescents in the U.S. As hypothesized, neuroticism and impulsivity were each independently associated with lifetime prevalence of binge eating. We also found that adolescents with high NI reported higher lifetime prevalence of binge eating than those with low NI or those with high levels of neuroticism but low levels of impulsivity. Our findings indicate that, while each personality trait was independently associated with lifetime binge eating, the combination of the two was even more strongly associated with binge eating.

Our findings support previous evidence linking neuroticism to eating disorders (Lilenfeld et al., 2006). Previous studies found neuroticism to be a risk factor for binge eating episodes (Koren et al., 2014) and found significant associations between neuroticism and other risk and maintenance factors for binge eating (e.g., low interpersonal esteem and depressive affect) (Mackinnon et al., 2011; Sherry & Hall, 2009). Our findings extend the literature by showing an association between neuroticism and binge eating in the general U.S. adolescent population since findings of studies with clinical samples are not generalizable to the general population (i.e., Berkson's bias (Berkson, 1946)). Longitudinal studies are needed to understand more about how neuroticism is related to the development and maintenance of binge eating. Additional facet-level studies of neuroticism may explain which specific component of neuroticism−for instance, anxiety or self-consciousness−is most likely to be associated with problematic eating.

Consistent with our hypothesis, we found a significant association between impulsivity and binge eating. Previous studies have reported under-controlled emotions and impulses among individuals with bulimic symptoms (Westen & Harnden-Fischer, 2001; Westen, Thompson-Brenner, & Peart, 2006). Our findings suggest the importance of considering the trait of impulsivity in adolescents who binge eat. Future studies should focus on investigating whether certain elements of impulsivity are particularly linked to binge eating. Assessing whether impulsive adolescents engage in binge eating because they lack abilities to consider long-term consequences of their binge eating behavior or binge eating fulfills their need for stimulation, for instance, will be beneficial in better understanding of the etiology of binge eating and guiding intervention approaches. Recent studies found an association between impulsivity and loss of control eating among children in community

(Hartmann, Rief, & Hilbert, 2013) and clinical pediatric (Reinblatt et al., n.d.) samples by using a behavioral assessment of impulsivity (i.e., response inhibition deficits). Future studies that use both behaviorally-assessed impulsivity and self-report personality measures may further clarify the role of impulsivity in problematic eating.

Our findings indicate that high NI has a particularly strong association with binge eating. Although a recent study found that the combination of high neuroticism and low impulsivity was associated with health benefits such as lower levels of inflammation (Turiano, Mroczek, Moynihan, & Chapman, 2013), we did not find any "healthy" combination of neuroticism and impulsivity that may be protective against binge eating. Based on previous findings of significant associations between negative urgency and binge/purge behaviors (Fischer, Smith, & Cyders, 2006; Fischer et al., 2008a), we speculate that adolescents with elevated neuroticism and impulsivity may be more likely to binge eat impulsively when they experience intense negative emotions to alleviate and/or to escape from perceived distress. Binge eating, however, does not always provide an immediate improvement in mood (Munsch et al., 2012). Binge eating may become a habitual vicious cycle for individuals with emotion and impulse dysregulation. Findings of our study suggest that it may potentially be important to detect and modify both personality traits to lower prevalence of binge eating among adolescents.

We also found that the associations between high NI and lifetime prevalence of binge eating was stronger for female adolescents than their male counterparts. These moderation analysis results are consistent with previous findings on gender differences in the associations between negative urgency and eating pathology among college students (Davis-Becker et al., 2014). Our findings indicate that having both high neuroticism and impulsivity

is maladaptive for both genders, but especially for female adolescents. It is possible that females with this particular combination of personality traits may be at greater risk for experiencing lifetime binge eating, although our findings cannot establish a causal link. If neuroticism and impulsivity are identified in future research as being risk or maintenance factors for binge eating, tailored intervention strategies for reducing high levels of these traits among adolescents, especially girls, should be explored.

We found no significant differences between adolescents with high NI and adolescents with low neuroticism but high impulsivity in associations with lifetime prevalence of binge eating. Highly impulsive and neurotic adolescents may be less different from highly impulsive but less neurotic adolescents, since negative urgency is closely linked with impulsivity (Fischer et al., 2008b; Whiteside & Lynam, 2001). Future studies using different scales of personality (e.g., both the NEO-Personality Inventory, Revised (Costa & McCrae, 1992) and UPPS-P Impulsive Behavior Scale (Whiteside & Lynam, 2001) may lead to a clearer knowledge of relationships among personality traits and their associations to problematic eating.

We cannot infer a causal relation between personality traits and binge eating due to our use of cross-sectional data in this study. If future research supports a causal relation, however, this will have implications for services and interventions that could target early identification and modification of neuroticism and impulsivity. Research suggests using personality traits to detect individuals with eating disorders or to screen individuals who are at risk of eating disorders may be useful since they often have a tendency to deny their eating-related problems and symptoms, which in turn may lead to under-detection of the disorder (Guarnido, Cabrera, & Osuna, 2013). Personality traits are modifiable (Krueger &

Tackett, 2003; Sutin, Ferrucci, Zonderman, & Terracciano, 2011) as children gain the capacity and skills to regulate emotions (Tackett, 2006) and learn from successful or unsuccessful experiences at tasks, such as academic achievement (Shiner, Masten, & Tellegen, 2002). Research suggests that non-shared environmental factors may contribute to the development of problematic eating as much as genetic factors do, and personality is considered only moderately heritable (30-60%) (Klump, McGue, & Iacono, 2002). Cognitive behavioral therapy has been shown to improve disorder symptomotology and to modify temperaments of patients with eating disorders (Agüera et al., 2012; Dalle Grave et al., 2007). Development and testing of interventions specifically designed to modify maladaptive temperaments in children are in early stages but have shown positive results (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014). Preliminary findings on targeting behavioral inhibition−a temperamental vulnerability that is closely associated with neuroticism and the development of anxiety disorders in preschool-aged children (Kennedy, Rapee, & Edwards, 2009; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2010)−by using cognitive and behavioral techniques (e.g., cognitive restructuring, social skills, coping plans) suggest that positive changes in personality traits are possible with psychological interventions in early ages.

This study has several limitations. First, no causal inferences can be made since the NCS-A is a cross-sectional study. Personality, however, generally develops before binge eating behavior, and several longitudinal studies on eating disorders suggest maladaptive personality traits as likely risk factors for developing an eating disorder (Bulik CM et al., 2006; Cervera et al., 2003; Lilenfeld, 2011; Lilenfeld et al., 2006). Future longitudinal studies assessing both genetic and environment variables associated with the development of

personality and their effects on the frequency and/or the severity of binge eating may be useful. Findings from experimental studies with a laboratory-based examination of personality in response to negative mood induction and its effect on binge eating may also extend our understanding of causal pathways by which personality is linked to binge eating. Second, as clinical interviews are generally not feasible for a population-based study, layperson interviewers gathered information regarding binge eating from adolescents. The CIDI, however, is a widely used measure and has good concordance with clinician diagnoses (Kessler, Avenevoli, Green, et al., 2009). Third, both the predictors and outcomes in the current study were self-reported, which may potentially lead to bias (e.g., social desirability). Self-reports, however, are not necessarily flawed or less meaningful than clinical assessments (Chan, 2009). Fourth, the ZKPQ is not the most commonly used personality measure, but it has good psychometric properties, and the factor structure of the measure was theoretically coherent in our sample.

Despite these limitations, to our knowledge this study is the first to use nationally representative data to investigate the associations between maladaptive personality traits and binge eating among adolescents. Early detection of problematic eating is challenging but needed. Our findings regarding neuroticism and impulsivity and their associations with binge eating at a population-level have potential to guide future research on etiology and maintenance factors in binge eating and development of effective prevention and early intervention strategies.

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Table 3.1 Participant characteristics with lifetime binge eating in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

Characteristics	Lifetime Binge Eating (n=437)	Comparison Group[a] (n=9,591)
Gender (n, %)		
Female	244 (55.84)	4,851 (50.58)
Male (=Reference)	193 (44.16)	4,740 (49.42)
Race (n, %)		
Non-White	236 (54.00)	4,198 (43.77)
White (=Reference)	201 (46.00)	5,393 (56.23)
Age (mean±SD)	15.40±1.52	15.17±1.50
Education[b] (mean±SD)	8.93±1.56	8.75±1.59

SD=Standard deviation
[a]Adolescents without lifetime AN, BN, BED, or SBED
[b]Missing data on education: lifetime binge eating (n=4); comparison group (n=29)
Note. Weighted Chi-square tests were conducted to compare sociodemographic characteristics of participants with lifetime binge eating to the comparison group.

CHAPTER 4. ASSOCIATIONS OF NEUROTICISM/IMPULSIVITY AND COPING WITH BINGE EATING IN A NATIONALY REPRESENTATIVE SAMPLE OF ADOLESCENTS IN THE UNITED STATES

Abstract

Binge eating behavior is a public health concern due to its negative physical and mental health consequences. This study extends our previous finding that the combination of high neuroticism and high impulsivity (NI) was associated with binge eating by examining relations among NI, coping styles, and binge eating. Little is known about interplay of NI and patterns of behavioral response to stress (i.e., coping) in relation to binge eating in the general adolescent population. This information will provide a more nuanced picture of potentially modifiable psychosocial correlates of problematic eating to inform future intervention development. We examined the associations among NI, coping styles (poor problem solving, distraction, and escape-avoidance) and lifetime prevalence of binge eating, using nationally representative, cross-sectional data from the National Comorbidity Survey: Adolescent Supplement (n=437). High NI was significantly associated with all three coping styles, especially escape-avoidance (β=3.96, confidence interval [CI]=3.62, 4.29, p<0.001). Gender was a significant moderator of the NI−distraction coping association (β=-0.68, CI=-1.33, -0.03, p=0.041), indicating a stronger association in males (β=1.20, CI=0.81, 1.58, p<0.001) than females (β=0.53, CI=0.02, 1.03, p=0.042). Lifetime prevalence of binge eating was 1.13 times higher with increased escape-avoidance coping (CI=1.10, 1.18, p<0.001). Our findings have potential to inform future development of interventions that target modification of both maladaptive personality traits and coping styles to reduce problematic eating.

4.1 Introduction

Recent findings from population-level studies suggest binge eating disorder (BED) is a public health concern (Austin, 2012; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011) due to its prevalence of 1.6% in adolescents (Swanson et al., 2011) and 2.8% in adults (Hudson, Hiripi, Pope, & Kessler, 2007) in the general U.S. population and its negative health consequences, including obesity (Marcus & Wildes, 2013; Neumark-Sztainer et al., 2007; Stankovic & Potenza, 2010) and comorbidity with almost all major psychiatric disorders (Fairburn et al., 1998; Hudson et al., 2007; Swanson et al., 2011). BED, a new diagnosis in DSM5 (American Psychiatric Association, 2013), is characterized by persistently consuming uncommonly large quantities of food with a sense of loss of control and distress. Subthreshold binge eating disorder is also problematic as it is more prevalent than BED in the general adolescent population (Swanson et al., 2011) and has associations with negative health outcomes (Sonneville et al., 2013; Stice, Marti, Shaw, & Jaconis, 2009; Swanson et al., 2011). Identification of psychosocial correlates of binge eating is an important first step toward developing prevention and treatment strategies to reduce binge eating. We previously found that the combination of high neuroticism and high impulsivity (NI) was significantly associated with higher lifetime prevalence of binge eating. Coping−cognitive and behavioral responses that individuals use to manage perceived stress (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986)−is linked with adolescents' well-being, such as adjustment, school performance, physical and mental health (Garcia, 2010; Schonert-Reichl, 2003; Sveinbjornsdottir & Thorsteinsson, 2008). We know little, however, about a potential interplay between NI and coping and their associations with binge eating in the general population. Identifying associations of NI with coping styles and binge

eating will provide a more nuanced understanding of how personality is linked with maladaptive patterns of behavior relevant for eating issues.

Evidence suggests that personality traits and coping styles have both independent and interactive effects on mental and physical health (Carver & Connor-Smith, 2010). Personality scholars have approached personality in different ways; the three major frameworks of personality include 1) Eyesenck's Three Factor Model (neuroticism, extraversion, and psychoticism) (Eysenck, Eysenck, & Barrett, 1985), 2) Costa and McCrae's Five Factor Model (FFM: neuroticism, conscientiousness, agreeableness, openness, and extraversion) (Costa & McCrae, 1992), and 3) Zuckerman and Kuhlman's alternative Five Factor Model, which proposes variations on the FFM and Eysenck models (Zuckerman, 2002; Zuckerman, Michael, Joireman, Teta, & Kraft, 1993). Research suggests that individuals with high neuroticism and low conscientiousness (i.e., high impulsivity) tend to be more vulnerable to stress and dysfunctional coping (Grant & Langan-Fox, 2006; Vollrath & Torgersen, 2000). We identified in our prior study (Aim 2) that NI is a significant correlate of binge eating behavior among adolescents in the general population. NI trait may reflect the construct of *negative urgency*−the tendency to engage in rash actions (i.e. impulsivity) under emotional distress (neuroticism) (Fischer, Smith, & Cyders, 2008; Racine et al., 2013; Settles et al., 2012; Whiteside & Lynam, 2001)−which was found to have a robust association with bulimic symptomatology (Fischer et al., 2008).

Learning adaptive skills to manage stress during adolescence is crucial (McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011; Silk et al., 2007; Steinberg & Avenevoli, 2000). Adolescents' coping patterns can impact both their present and future well-being (Broderick & Korteland, 2002; Garcia, 2010; Schonert-Reichl, 2003), which highlights the

importance of early establishment of adaptive coping behavior. Enhancing coping skills, especially problem solving, emotion regulation, and social support, may increase youth's resilience when faced with stressors (Compas, Champion, & Reeslund, 2005). Theorists have grouped coping in several ways (Carver & Connor-Smith, 2010; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Skinner, Edge, Altman, & Sherwood, 2003). One common way of distinguishing coping styles is problem- vs. emotion-focused coping (Lazarus & Folkman, 1984). Generally, problem-focused coping (e.g., logical analysis, direct action, decision making, planning) (Skinner et al., 2003) attempts to remove a stressor or minimize its impact, and emotion-focused coping (e.g., avoidance, denial, wishful thinking, rumination, yelling, crying) aims to diminish distress caused by a stressor (Carver & Connor-Smith, 2010; Lazarus & Folkman, 1984).

No coping skill is considered completely adaptive or maladaptive, but problem-focused coping is generally linked with better adjustment and well-being whereas emotion-focused coping is associated with increased distress and psychopathology (Ball & Lee, 2000; Compas et al., 2001; Ghaderi & Scott, 2000), including eating disorders (Ball & Lee, 2000; Compas et al., 2001). For instance, distraction coping, which aims to divert attention by engaging in secondary behavioral or cognitive activities (Skinner et al., 2003), was also associated with both same day and next day binge eating (Freeman & Gil, 2004). Avoidance coping (e.g., escape, disengagement, wishful thinking) (Skinner et al., 2003) has been proposed as a predictor of eating disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010) and has been reported in patients with anorexia nervosa (AN) or bulimia nervosa (BN) in the U.S. and other countries (Bloks, Spinhoven, Callewaert, Willemse-Koning, & Turksma, 2001; Bloks, Van Furth, Callewaert, & Hoek, 2004; Brytek-Matera & Schiltz, 2013;

Fitzsimmons & Bardone-Cone, 2010; Lobera, Estébanez, Fernández, Bautista, & Garrido, 2009; Nagata, Matsuyama, Kiriike, Iketani, & Oshima, 2000; Troop, Holbrey, & Treasure, 1998; Troop, Holbrey, Trowler, & Treasure, 1994), female college students in the U.S (Dennard & Richards, 2013; Kelly, Lydecker, & Mazzeo, 2012; Wonderlich-Tierney & Vander Wal, 2010; Wolff, Crosby, Roberts, & Wittrock, 2000), and community samples of adolescents in Spain (García-Grau, Fusté, Miró, Saldaña, & Bados, 2002, 2004).

Research suggests that coping can be considered "personality in action" (Bolger & Zuckerman, 1995) based on a moderate shared genetic basis between coping and personality (Kato & Pedersen, 2005) as well as their strong correlations (Connor-Smith & Flachsbart, 2007). A recent-meta analysis of personality−coping associations based on the FFM (Costa & McCrae, 1992) revealed a general pattern of increased use of emotion-focused coping and decreased use of problem-focused coping in high neuroticism or low conscientiousness (Connor-Smith & Flachsbart, 2007). Studies that used Eysenck's personality model (Eysenck et al., 1985) showed that young Canadian males (age 17-21) with serious gambling issues characterized by increased impulsivity/intensity seeking were more likely to use avoidance and distraction coping (Nower, Derevensky, & Gupta, 2004), and neuroticism and psychoticism had direct positive effects on avoidance coping among Croatian adolescents (Kardum & Krapić, 2001). Consideration of personality and coping in association with binge eating may guide the development of interventions that target either or both maladaptive personality traits and coping styles to decrease problematic eating among adolescents.

Evidence suggests that coping strategies individuals use to deal with stress may reduce or amplify personality−psychopathology associations (Carver & Connor-Smith, 2010). Current findings on moderation effects of coping on

temperament/personality−psychopathology associations are inconsistent. For instance, using avoidance or denial coping strategies has been shown to strengthen the relationships between the behavioral approach (e.g., a tendency to seek rewards) and disordered eating among Australian adolescents (Hasking, 2006). However, another study showed emotion-oriented coping reduced the strength of associations between trait anxiety and disordered eating, indicating possible short-term usefulness of avoidance coping (Fitzsimmons & Bardone-Cone, 2010). Investigating coping as a potential moderator of the associations between personality traits and binge eating may inform future interventions to decrease the use of maladaptive coping.

Research also suggests that personality−psychopathology associations may differ by gender (Tackett, 2006). For example, negative urgency was only significantly associated with disordered eating among female college students but not their male counterparts (Davis-Becker, Peterson, & Fischer, 2014). Assessing potential gender differences between personality traits and binge eating may be worthwhile for designing intervention programs that could benefit either or both genders.

Little is known about associations among NI, coping styles, and binge eating, and no studies, to the authors' knowledge, have investigated NI and coping styles in associations with binge eating in a nationally representative sample of adolescents. We are also not aware of any studies that assessed the role of coping as a moderator of the association between personality and binge eating in the general adolescent population. Identification of relationships among NI, coping styles, and binge eating may be a helpful initial step in identifying modifiable psychosocial correlates of binge eating in adolescence.

We used data from the National Comorbidity Survey Adolescent Sample (NCS-A) (Kessler, Avenevoli, Costello, et al., 2009; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009), to assess associations among NI, coping styles, and binge eating in the general United States adolescent population. Based on previous research, we hypothesized that avoidance, distraction, and poor problem solving would be positively associated with NI and lifetime prevalence of binge eating. We also hypothesized that avoidance, distraction, and poor problem solving would moderate the associations between NI and lifetime binge eating. We also explored adolescent gender as a potential moderator of each NI−coping and coping−lifetime binge eating association.

4.2 Methods

4.2.1 Study Design and Participants

The NCS-A is a nationally representative, cross-sectional dataset that contains information such as prevalence estimates, correlates, and service use patterns for major psychiatric disorders in a U.S. sample of 10,148 adolescents aged 13 to 18 years (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009). Detailed description of the NCS-A's background, measures, and design is provided elsewhere (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009). We received authorization to access the restricted NCS-A data from the Interuniversity Consortium for Political and Social Research and also obtained Johns Hopkins Bloomberg School of Public Health IRB approval for this study.

We studied 437 adolescents with lifetime binge eating (i.e. either lifetime BED or lifetime subthreshold BED [SBED]) and compared them to 9,591 adolescents without lifetime AN, BN, BED, or SBED.

4.2.2 Measures

The NCS-A used a modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Üstün, 2004), administered by lay interviewers who assessed BED symptoms and diagnosis among adolescents. The CIDI is a widely used diagnostic instrument that has exhibited good psychometric properties (Green et al., 2012; Kessler, Avenevoli, Green, et al., 2009). All items related to binge eating in this study had dichotomous (yes or no) responses. For the purpose of the current study, we combined adolescents with lifetime BED (n=162) and adolescents with lifetime SBED (n=275) and grouped them together as 'adolescents with lifetime binge eating (n=437) to capture a wider range of adolescents with binge eating issues since few children and adolescents meet full criteria for BED (Shomaker, Tanofsky-Kraff, & Yanovski, 2011).

Lifetime binge eating disorder (BED) The NCS-A's definitions of BED followed the proposed DSM5 criteria (Swanson et al., 2011). Lifetime BED was defined as: 1) ever engaging in binge eating at least twice a week for three months or longer; 2) having one or more out of four indicators of a sense of lack of control while binge eating; 3) having three or more out of five features associated with binge eating; 4) having one or more out of four indicators of marked distress due to binge eating; 5) not engaging in inappropriate compensatory behaviors such as purging; and 6) not meeting the diagnostic criteria for lifetime AN or BN (see Appendix A for details).

Lifetime Subthreshold Binge Eating Disorder (SBED) Lifetime SBED was characterized as: 1) ever engaged in binge eating at least two days a week for three months or longer; 2) with one or more out of four indicators of a sense of lack of control; and 3) does not meet diagnostic criteria for AN, BN, or BED. The major difference between BED and SBED is that SBED does not require several additional features of binge eating and marked distress due to binge eating (see Appendix B for details).

Personality The NCS-A's personality assessment was largely adapted from the *Zuckerman Kuhlman Personality Questionnaire* (ZKPQ) (Zuckerman et al., 1993). Detailed description of the five personality types in the ZKPQ and its validity information are provided in Aim 2, as well as results of our own exploratory factor analysis to identify the structure of personality in this sample. In this study, we used the trait of NI (a combination of high neuroticism and high impulsivity) in analyses.

Coping The NCS-A assessed adolescents' coping with twenty self-report items adapted primarily from the *Ways of Coping Scale* (WOCS) (Folkman & Lazarus, 1980; Folkman & Lazarus, 1985). The items included both problem- and emotion-focused coping as commonly assessed in coping scales (Skinner et al., 2003). Sample questions included, "How much would you seek advice from other people?" (problem-focused coping) and "How much would you daydream about how things used to be?" (emotion-focused coping). The WOCS's reliability varies based on sample variables (e.g., gender) and how it was administered (e.g., self-report) (Rexrode, Petersen, & O'Toole, 2008). As the WOCS was not developed based on a priori coping constructs but by aggregating various coping strategies, factor structures for the WOCS also vary across study samples (Edwards & O'Neill, 1998).

We conducted an exploratory factor analysis (EFA) to identify the structure of coping in this sample, given the variability in factor structure of the WOCS. Since responses on the coping measure were coded on a four-point Likert-like scale (a lot, some, a little, not at all), we performed polychoric correlations for categorical items for EFA. Inspection of the results from a principal component analysis and a parallel analysis as well as the Scree plot indicated a three-factor solution that accounted for 46.84% of the variance. We identified three factors: 1) problem solving (4 items), 2), distraction (6 items) and 3) escape-avoidance (7 items). Our EFA results replicate previous studies that found distraction to be a separate factor from escape-avoidance (Ayers, Sandler, West, & Roosa, 1996; Compas et al., 2001; Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000; Connor-Smith & Flachsbart, 2007; Skinner et al., 2003). There was no gender variances in the factor structure. We discarded one item, "rely on your religious beliefs to help you cope," because it had a loading lower than 0.40 and cross-loaded on more than one factor from the analysis. We dropped two items, "do special things to treat yourself" and "do special things to help yourself relax" because of the use of ambiguous language that could be interpreted as both adaptive (e.g., practice yoga) and maladaptive (e.g., use illegal substance) coping. For the main analyses, we reverse coded the problem solving items to represent "poor problem solving" as a set of maladaptive coping skills. The poor problem solving scale ranged from 0 to 12, the distraction scale ranged from 0 to 18, and the escape-avoidance scale ranged from 0 to 21. Internal consistencies of each scale were acceptable (Cronbach's alpha for poor problem solving=0.64; distraction=0.61; escape-avoidance=0.72).

4.2.3 Statistical Analyses

Preliminary analyses included calculating descriptive statistics for each demographic variable (gender, race, age, and education) and exploring their associations with NI, coping styles, and lifetime binge eating using weighted Chi-square tests. To explore the association of demographic variables with coping styles, we performed a median split (median for poor problem solving=3; distraction=11; escape-avoidance=8) and dichotomized each coping style as high vs. low groups. For analyses with lifetime binge eating as our binary outcome of interest, we used generalized linear modeling with a modified Poisson approach to calculate adjusted prevalence ratios (Barros & Hirakata, 2003; Zou, 2004). For analyses with coping styles as our continuous outcome of interest, we used generalized linear modeling with Gaussian family and identity link.

To test our first hypothesis regarding the NI−coping associations, three coping styles (poor problem solving, distraction, and escape-avoidance) were our dependent variables in separate models, and NI (high NI vs. low NI) was our independent variable of interest. To test our second hypothesis regarding coping−binge eating associations, lifetime prevalence of binge eating (endorsed vs. not endorsed) was our dependent variable, and the three coping styles were our independent variables. We first conducted unadjusted analyses and then analyses adjusted for adolescents' age, education, gender, and race, as these variables were associated with eating disorders in previous studies (Hudson et al., 2007; Marques et al., 2011; Swanson et al., 2011; Thompson-Brenner et al., 2013). Other sociodemographic correlates, including parental education, parental marital status, household income, and urbanicity, were not controlled for in our models since they were not found to be associated with any eating disorders in the NCS-A (Swanson et al., 2011).

To assess coping as a moderator of the NI−binge eating association, we created interaction terms between NI and each coping style and entered the relevant terms into three regression models (one measure of personality trait predicting one binge eating measure, moderated by three measures of coping style). To explore adolescent gender as a potential moderator of the NI−coping associations, we created an interaction term between NI and gender and entered the relevant term into three regression models (one measure of personality trait predicting three coping measures). To explore adolescent gender as a potential moderator of the coping style−binge eating relationships, we created an interaction term between each coping style and gender and entered the relevant terms into three regression models (three measures of coping styles each predicting one binge eating measure).

We used listwise deletion by default to handle missing data since less than 2% of responses in this study were missing. To account for the sampling method of the NCS-A, complex survey weights with proper variables for the survey's clustering and stratification were applied prior to all analyses. Statistical significance was set at p-values less than 0.05. All analyses were performed using Stata12 (StataCorp, 2011).

4.3 Results

4.3.1 Sample Characteristics

We compared the lifetime binge eating group (n=437; female=55.84%) to the comparison group (n=9,59; female=50.58%). The mean ages were 15.40 years (SD=1.52) for the lifetime binge eating group and 15.17 years (SD=1.50) for the comparison group. The mean years of education were 8.93 years (SD=1.56) for the lifetime binge eating group and

8.75 years (SD=1.90) for the comparison group. The binge eating group was different from the comparison group with regard to race (χ^2=20.32, p=0.003) with a greater proportion of non-Whites in the binge eating group. Gender, age, and education did not differ between the lifetime binge eating group and the comparison group.

4.3.2 Association of Demographic Characteristics with Neuroticism-Impulsivity and Coping

The high NI group was different from the low NI group with regard to gender (χ^2=20.62, p=0.023) with a greater proportion of females in the high NI Group. Race, age, and education did not differ by NI status.

The high poor problem solving group (χ^2=65.98, p<0.001), the high distraction group (χ^2=42.42, p<0.001), and the high escape-avoidance group (χ^2=146.56, p<0.001) were different than the comparison group with regard to gender, with a greater proportion of males in the high poor problem solving group and the high distraction group and a greater proportion of females in the high escape-avoidance group. The high distraction group (χ^2=58.73, p<0.001) and the high escape-avoidance group (χ^2=60.96, p<0.001) were different from the comparison group with regard to race with a greater proportion of non-Whites in the high distraction group and the high escape-avoidance group. Age and education did not differ by all three coping status.

4.3.3 Associations Between Personality Traits and Coping Styles

Table 1 shows correlations of impulsivity, neuroticism, and NI as personality traits with poor problem solving, distraction, and escape-avoidance as coping styles. Neuroticism showed a moderate correlation with escape-avoidance coping, very weak correlations with

poor problem solving and distraction coping, and a weak correlation with impulsivity. Impulsivity showed very weak correlations with all three coping styles. NI showed a moderate correlation with escape-avoidance coping, very weak correlations with poor problem solving and distraction coping, and strong correlations with neuroticism and impulsivity. Poor problem solving showed very weak correlations with escape-avoidance and distraction coping. Escape-avoidance coping showed a weak correlation with distraction coping (see Table 1).

High NI was significantly associated with all three coping styles (poor problem solving: β=0.63, CI=0.36, 0.90, $p<0.001$; distraction: β=0.86, CI=0.55, 1.16, $p<0.001$; escape-avoidance: β=3.96, CI=3.62, 4.29, $p<0.001$). Gender was a significant moderator of the NI and distraction coping (β=-0.68, CI=-1.33, -0.03, p=0.041); the NI−distraction coping was stronger for males (β=1.20, CI=0.81, 1.58, $p<0.001$) than females (β=0.53, CI=0.02, 1.03, p=0.042).

4.3.4 Associations Between Coping and Lifetime Binge Eating

Lifetime prevalence of binge eating was 1.13 times higher with increased escape-avoidance coping (CI=1.10, 1.18, $p<0.001$). Poor problem solving and distraction were not associated with lifetime prevalence of binge eating. None of the coping styles moderated the association between NI and lifetime binge eating (see Table 2). Interaction tests revealed no moderation by adolescent gender of the associations between coping styles and lifetime binge eating.

4.4 Discussion

The present study investigated the associations among NI, coping styles, and lifetime prevalence of binge eating. Females reported higher levels of NI and used more escape-avoidance coping than males, whereas males reported using less problem solving and more distraction coping than females. There were no racial differences in NI, but non-Whites reported more use of distraction and escape-avoidance coping than Whites. Correlations among personality traits and coping styles were modest, corroborating prior evidence that personality and coping are not the same construct, and coping is not just a manifestation of personality (Carver & Connor-Smith, 2010). Our findings partially supported our hypotheses; NI was positively associated with all three coping styles, but only escape-avoidance coping was significantly associated with higher lifetime prevalence of binge eating. Counter to prediction, none of the coping styles moderated the association of NI and lifetime binge eating. Gender moderated the association between NI and distraction coping but none of the coping−lifetime binge eating associations.

Our findings indicate that adolescents with high neuroticism and impulsivity engage in more maladaptive coping than those low in these traits. Previous studies suggest possible explanations for these findings (Carver & Connor-Smith, 2010; Connor-Smith & Flachsbart, 2007). Evidence suggests that individuals with high neuroticism are more likely than those with low neuroticism to have frequent exposures to stressors and to appraise stressful events as more threatening and perceive their coping resources as less adequate (Bolger & Zuckerman, 1995; Grant & Langan-Fox, 2007). Because of their tendencies to experience stressful events more intensely than others, they are more likely to engage in coping styles that provide immediate short-term relief of distress, particularly wishful thinking and

withdrawal, but less likely to use problem solving skills that require focus and cognitive strengths (Connor-Smith & Flachsbart, 2007) and may lead to better resolution of the stressful situation. Individuals who score low in conscientiousness (i.e., high in impulsivity) tend to lack plans for dealing with potential stressors and are more likely to engage in impulsive actions when faced with stressful situations, which can lead them to even greater problems (Carver & Connor-Smith, 2010; Vollrath, 2001). Impulsive individuals, therefore, are less likely to use problem solving but more likely to engage in unplanned, rash, and less deliberate coping, such as denial and substance use (Carver & Connor-Smith, 2010; Connor-Smith & Flachsbart, 2007). Based on these findings, we speculate that adolescents with high NI have increased vulnerability to stress and reduced capacity to problem solve, which in turn would lead to impulsive use of distraction or escape-avoidance coping. Future longitudinal and experimental studies are needed to further evaluate this hypothesized pathway.

Our finding of a positive association between escape-avoidance coping and binge eating is similar to previous findings of a population-based study on escape-avoidance coping among individuals with current or past DSM-IV eating disorders, including AN, BN, a combination of AN and BN, or eating disorders not otherwise specified (EDNOS) (Ghaderi & Scott, 2000) or findings from studies with community adolescent samples on escape-avoidance coping and binge eating (Sierra Baigrie, 2008; Sierra-Baigrie, Lemos-Giráldez, Paino, & Fonseca-Pedrero, 2012). Evidence suggests that escape-avoidance coping serves as a short-term stress relief by immediately disconnecting individuals from the stressful situation (Aldao et al., 2010; Connor-Smith & Flachsbart, 2007). This approach, however, may be ineffective in the long term since it prevents individuals from engaging in active

problem solving to resolve issues (Ben-Zur, 2009) and may also result in repeated use of unhealthy behaviors (e.g., substance use, problematic eating behaviors) as avoidance techniques (Aldao et al., 2010; Connor-Smith & Flachsbart, 2007). Escape-avoidance coping have been shown to result in a paradoxical increase in unpleasant thoughts about stressors, which in turn increases negative mood (Carver & Connor-Smith, 2010; Najmi & Wegner, 2008). Our findings highlight that escape-avoidance coping may be a key correlate of binge eating among adolescents.

We were not, however, able to investigate whether adolescents use binge eating as a coping strategy. Escape theory conceptualizes binge eating as a means of escaping from aversive self-awareness (e.g., high standards of self; sensitivity to others' perception of self) that is accompanied by emotional distress (Heatherton & Baumeister, 1991). Future assessment of whether adolescents engage in binge eating as a form of escape-avoidance coping would be beneficial in clarifying the associations between escape-avoidance coping and binge eating.

In contrast to our expectations, no coping styles moderated the association of NI and lifetime binge eating. One possible explanation is that coping may be a mediator of personality−binge eating associations, rather than a moderator. Because we used cross-sectional data, we were not able to conduct mediation analyses. Future longitudinal studies should assess the role of coping as a mediator among personality, coping, and binge eating. Another potential explanation is that personality and coping may be separate correlates of binge eating that do not necessarily have an additive effect. Additional studies should also explore the use of multiple coping styles and their associations with binge eating, as coping strategies may be used in combination. Future examination of the temporal ordering of

different coping skills (e.g., using avoidance coping first and then using problem solving) and how certain sets of coping styles facilitate each other may be useful for a better understanding of coping. Findings from such investigations also may be helpful in differentiating coping strategies with respect to their long-term adaptiveness versus their short-term effectiveness (i.e., immediate effects on reducing experienced distress) of coping (Edlynn, Gaylord-Harden, Richards, & Miller, 2008; Tolan, Guerra, & Montaini-Klovdahl, 1997).

We found that the association between NI and distraction coping was stronger for males than females. A previous study found that while both young male and female adults with severe gambling problems displayed increased impulsivity, only males showed increased use of distraction coping (Nower et al., 2004). Our findings indicate that it may be beneficial to further evaluate male adolescents who frequently use distraction coping in stressful situations. Intervention studies to foster adaptive coping skills, using both universal and gender-specific strategies, may yield further insights regarding gender differences in associations of personality traits and coping styles.

Our findings are consistent with research indicating that interventions to reduce the use of maladaptive coping styles may decrease binge eating. For example, evidence-based treatments such as dialectical behavior therapy (Linehan, 1993) and acceptance commitment therapy (Hayes, Strosahl, & Wilson, 1999) that include training modules such as practicing mindfulness to target escape-avoidance as dysfunctional coping and promote the use of appropriate regulations of responses to emotionally overwhelming situations have been shown to reduce binge episodes in clinical samples (Chen, Matthews, Allen, Kuo, & Linehan, 2008; Lillis, Hayes, & Levin, 2011). Future studies should investigate whether

these evidence-based treatments are effective in modifying both maladaptive personality traits and coping styles among adolescents.

Our findings should be interpreted with several limitations in mind. First, as the NCS-A is a cross-sectional study, we cannot make causal inferences about the relationships among personality, coping, and binge eating. Future longitudinal studies should assess these associations by using, for example, participants' daily reports to better understand immediate effects of perceived stress on use of coping strategies, including binge eating. Studies with experimental designs that expose participants to standardized stressors may also allow researchers to observe and to test hypotheses regarding participants' coping strategies, personality traits, and binge eating behavior. Second, the NCS-A used layperson interviewers to gather information regarding binge eating from adolescents. The CIDI, however, is a widely used measure in population-level studies and has good concordance with clinician diagnoses (Kessler, Avenevoli, Green, et al., 2009). Third, coping measures in the current study were self-reported, and responses may have been influenced by, for example, memory bias (Fredrickson, 2000). The authors are not aware of any clinical interviews to assess coping. Self-reports are also not necessarily unsound or less significant than clinical assessments (Chan, 2009). Lastly, the NCS-A collected only dispositional coping styles (i.e., general responses to stress). Effectiveness of coping strategies may be context-dependent. Future investigation should include situational coping strategies to understand which kinds of coping strategies are effective for which types of settings.

Despite these limitations, our findings extend the current understanding of the associations among personality, coping, and binge eating among adolescents. Our study, to our knowledge, is the first to use nationally representative data to investigate the combined

personality trait of neuroticism and impulsivity, coping styles, and binge eating in the general U.S. adolescent population. Our findings have potential to guide future research on risk factors for binge eating and the development of programs that could modify both maladaptive personality traits and coping styles to lower problematic eating among adolescents.

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Table 4.1 Correlations among personality traits and coping styles in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

	Neuroticism	Impulsivity	Neuroticism-Impulsivity	Poor Problem Solving	Distraction	Escape-Avoidance
Neuroticism	-	0.14	0.70	0.05	0.04	0.42
Impulsivity		-	0.81	0.12	0.10	0.18
Neuroticism-Impulsivity			-	0.11	0.09	0.38
Poor problem solving				-	-0.10	-0.05
Distraction					-	0.26
Escape-Avoidance						-

Table 4.2 Regression analyses evaluating the associations of personality, coping, and interactions of personality and coping with lifetime binge eating in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

	Lifetime Binge Eating			
Variables	β	SE	t	p
Coping				
Poor Problem Solving	1.07	0.05	1.64	0.108
Distraction	1.06	0.03	1.95	0.058
Escape-Avoidance	1.14	0.02	7.71	<0.001*
Interaction: Personality x Coping				
NI x Poor Problem Solving	1.04	0.11	0.36	0.719
NI x Distraction	0.86	0.07	-1.98	0.054
NI x Escape-Avoidance	0.93	0.04	-1.50	0.140

SE=linearized standard error
*statistically significant

CHAPTER 5. DISCUSSION

This chapter will first present main findings from each of the three studies separately, followed by the dissertation's limitations and strengths. The chapter will close with a discussion of the dissertation's public health implication and final conclusion.

5.1 Study Overviews and Key Findings

5.1.1 Gender and racial/ethnic differences in prevalence and symptoms of binge eating

The study presented in Chapter 2 examined gender and racial/ethnic differences in lifetime prevalence of BED and SBED and endorsement of specific BED symptoms. This study, to the best of our knowledge, is the first to assess both gender and racial/ethnic differences in prevalence and symptoms of binge eating among adolescents and to explore race/ethnicity as a potential moderator of the gender-binge eating associations using nationally representative data and controlling for potential confounders.

Females showed higher lifetime BED prevalence than males, but no gender differences in lifetime SBED prevalence were found. Females endorsed more BED symptoms associated with loss of control and distress than males. Non-Hispanic Blacks and Hispanics displayed higher lifetime SBED prevalence, but no racial/ethnic differences in lifetime BED prevalence were found. We also found different patterns of BED symptoms across racial/ethnic groups; non-Hispanic Blacks reported less distress than non-Hispanic Whites, whereas Hispanics reported more loss of control and distress than their non-Hispanic White and non-Hispanic Black counterparts. Lastly, race/ethnicity was not a significant moderator of the gender-binge eating associations. In addition to an existing link between binge eating and obesity, our findings on significant gender and racial/ethnic differences in

binge eating prevalence and symptom presentation suggest the importance of raising awareness of binge eating, particularly in non-Hispanic Black male adolescents.

5.1.2 Associations of neuroticism and impulsivity with binge eating

The study described in Chapter 3 assessed the associations of neuroticism and impulsivity−both independently and in combination−with lifetime prevalence of binge eating. This study fills gaps in the literature in binge eating research by using nationally representative data to investigate the associations between maladaptive personality traits and binge eating among adolescents.

Neuroticism and impulsivity were each independently and jointly associated with higher lifetime prevalence of binge eating. The combination of neuroticism and impulsivity was even more strongly associated with higher lifetime prevalence of binge eating. Gender was a significant moderator of the combined personality traits−binge eating association; this association was stronger for females than males. In conclusion, having high levels of both neuroticism and impulsivity was linked with binge eating problems, especially for female adolescents.

5.1.3 Associations of neuroticism/impulsivity and coping with binge eating

The study presented in Chapter 4 investigated associations among the combined personality trait of neuroticism and impulsivity (NI), coping styles (poor problem solving, distraction, and escape-avoidance), and binge eating. Females reported higher levels of NI than males, but no racial/ethnic differences in NI were found. Females reported using more escape-avoidance coping and problem solving than males, whereas males reported using

distraction coping more frequently than females. Non-Whites reported more use of distraction and escape-avoidance coping than Whites. NI was positively associated with all three coping styles. Only escape-avoidance coping was significantly associated with higher lifetime prevalence of binge eating. We found no moderating effect of coping styles on the associations between NI and binge eating. Gender was a significant moderator of the NI−distraction coping association; this association was stronger for males than females. In sum, we found significant associations between NI and all three coping styles as well as avoidance coping and binge eating. Reducing the use of distraction coping, especially among male adolescents, may be beneficial for reducing binge eating; further research using longitudinal and experimental methods is needed to establish this.

5.2 Limitations and Strengths

The main limitation of the studies presented in Chapters 2, 3, and 4 involve the cross-sectional nature of the NCS-A. We cannot make causal inferences about the relationships among personality and binge eating (Chapter 3) or personality, coping, and binge eating (Chapter 4) because the NCS-A is a cross-sectional study. Development of personality, however, precedes development of binge eating behavior as findings from several longitudinal studies found maladaptive personality traits as risk factors for developing an eating disorder (Bulik CM et al., 2006; Cervera et al., 2003; Lilenfeld, 2011; Lilenfeld et al., 2006). It is also possible we would have obtained different patterns of gender and racial/ethnic differences in binge eating prevalence and symptom presentation (Chapter 2) if the study was conducted in more recent years, rather than in 2001-2004, due to cohort effects.

Another limitation of the dissertation studies involves measurement of our independent and dependent variables. The NCS-A used layperson interviews to gather information on binge eating from adolescents. Interviews administered by a clinician are generally not feasible for a population-based survey. The CIDI, however, is a widely used measure in population-level studies and has good concordance with clinician diagnoses (Kessler, Avenevoli, Green, et al., 2009). The use of self reports on personality and coping may potentially lead to bias (e.g., social desirability) or may have been influenced by, for example, memory bias (Fredrickson, 2000). Self-reports, however, are not necessarily unsound or less meaningful than clinical assessments (Chan, 2009). In Chapter 2, the use of stem question in the NCS-A limited our analyses on frequency and duration of binge eating to adolescents who only reported to have experienced binge eating "at least twice a week for several months or longer." We could not examine gender and racial/ethnic differences in binge eating among adolescents who binged less frequently or for a shorter period. Because the NCS-A did not specify which racial/ethnic groups comprised its "Other" category, we excluded this category from our analyses; as a result, we were only able to evaluate associations of White, non-Hispanic Black, and Hispanic race/ethnicity with study constructs. In Chapter 3, the NCS-A used the ZKPQ to assess personality, which is not the most commonly used personality measure. The ZKPQ, nonetheless, has good psychometric properties and its factor structure was theoretically consistent in our sample. In Chapter 4, only dispositional coping styles−general responses to stress− but not situational coping styles were collected in the NCS-A.

The dissertation studies have several strengths. The primary strength is that the NCS-A is a nationally representative sample of adolescents, which enhances generalizability of the

studies' findings. This study also, to our best knowledge, is the first to assess gender, race/ethnicity, personality, and coping as correlates of binge eating in the general adolescent population. Our findings on sociodemographic and psychosocial factors associated with binge eating among in a representative U.S. adolescent sample contribute to the literature on problematic eating during adolescence and have potential to inform subsequent longitudinal studies and intervention development.

5.3 Implications

The results reported in Chapter 2 support and expand on previous research assessing gender and racial/ethnic differences in reporting of BED symptoms related to loss of control and distress. Our findings on gender differences in BED symptoms suggest recognition of such differences may help with proper screening and treatment outcomes. Future research incorporating qualitative approaches to evaluate both genders' experience and perspectives on binge eating may help to better clarify the reasons for gender differences in symptom reporting. Our findings on significant racial/ethnic differences in lifetime SBED prevalence highlight that binge eating is indeed a concern in racial/ethnic minority adolescents. Racial/ethnic differences in BED symptoms of loss of control or distress indicate the need for culturally relevant screening tools. Future research should examine the role of cultural factors in development and maintenance of problematic eating behaviors. In sum, our findings highlight the importance of recognizing variability in prevalence and symptoms of binge eating across gender and racial/ethnic groups for tailored intervention strategies that could suit needs of adolescents with binge eating.

Our findings regarding significant associations between personality traits and binge eating in Chapter 3 suggest the importance of considering neuroticism and impulsivity, and their combination, when assessing adolescents who binge eat. Our findings support previous evidence that neuroticism and impulsivity are associated with eating disorders and extend the literature by finding the combination of the two is a significant correlate of binge eating. Future longitudinal, experimental, and intervention studies are needed to fully understand the mechanisms of personality traits in associations with binge eating. Facet-level studies of neuroticism and impulsivity may also explain which components of these personality traits are most associated with binge eating. Our moderation analysis results indicate higher likelihood of binge eating in females with high levels of both neuroticism and impulsivity. If future research supports a causal relationship of these personality traits and binge eating, health and mental health care providers may benefit from considering the use of intervention strategies that could simultaneously address both neuroticism and impulsivity in adolescents with binge eating issues, especially females. In sum, our findings have implications for future services and interventions that could target early identification and modification of neuroticism and impulsivity.

Our findings from the third study add to the literature on the associations between personality and coping and their associations to binge eating. This study focused specifically on the combined personality traits of neuroticism and impulsivity, coping styles (poor problem solving, distraction, and escape-avoidance), and binge eating. Adolescents with high levels of both neuroticism and impulsivity reported engaging more in all three maladaptive coping styles than those with low levels of both personality traits. Future research should investigate whether individuals engage in binge eating as a type of avoidance coping

strategy. Longitudinal studies should explore the role of coping as a mediator of the associations between personality and problematic eating behavior. Male adolescents who frequently use distraction coping may benefit from additional attention. Researchers and health care providers may find it useful to implement universal strategies that could foster adaptive coping skills for both genders and tailored strategies that aim to address the use of distraction coping among adolescents, particularly males. In sum, our findings offer a more detailed picture of the association of personality traits and coping styles and have implications for guiding future development and assessment of interventions that aim to modify maladaptive personality and coping.

5.4 Conclusions

Binge eating in adolescents warrants attention from a public health standpoint due to its harmful and often long-lasting health consequences, and early recognition of problematic eating is challenging but desired. This research sought to gain a better understanding of sociodemographic and psychosocial correlates of binge eating among adolescents. We found significant gender and racial/ethnic differences in lifetime prevalence and symptom presentation of binge eating. Findings from this study have important implications for consideration of these differences in screening, preventing, and treating binge eating among adolescents in efforts to reduce potential health disparities. We also found significant associations among personality traits, coping styles, and binge eating. Our findings have potential to guide future research on etiology and factors for binge eating and the development of effective prevention and early intervention programs to lower problematic eating among adolescents.

5.5 References

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APPENDIX

Appendix A

Algorithm for Binge Eating Disorder

A. Both 1 and 2

1. Recurrent episodes of eating, in a discrete period of time (e.g., within any 2 hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances

2. A sense of lack of control over eating disorder during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating), indicated by one (or more) of the following:

   1) eating until feeling uncomfortably full,

   2) eating large amounts of food when not feeling hungry,

   3) eating alone because of being embarrassed by how much one is eating, or

   4) being often upset both during and after binge eating.

B. The binge eating episodes are associated with three (or more) of the following:

   1) eating much more quickly than usual,

   2) eating until feeling uncomfortably full,

   3) eating large amounts of food when not feeling hungry,

   4) eating alone because of being embarrassed by how much one is eating, or

   5) feeling guilty, very upset with oneself, or depressed after binge eating

C. The binge eating episodes are accompanied with marked distress regarding binge eating, indicated by one (or more) of the following:

   1) feeling guilty, very upset with oneself, or depressed after binge eating

2) worry about the long term effects of binge eating on health, weight, or on body shape

3) around the time binging−very afraid you would gain weight

4) being often upset during and after binge eating

D. The binge eating occurs, on average at least 2 days a week for 3 months

E. The binge eating is not associated with the regular use of inappropriate compensatory behaviors (e.g., purging, fasting, excessive exercise) and does not occur exclusively during the course of Anorexia Nervosa or Bulimia Nervosa.

Appendix B

Algorithm for Subthreshold Binge Eating

A. Both 1 and 2

1. Recurrent episodes of eating, in a discrete period of time (e.g., within any 2 hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances

2. A sense of lack of control over eating disorder during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating), indicated by one (or more) of the following:

1) eating until feeling uncomfortably full,

2) eating large amounts of food when not feeling hungry,

3) eating alone because of being embarrassed by how much one is eating, or

4) being often upset both during and after binge eating.

B. The binge eating occurs, on average at least 2 days a week for 3 months

Appendix C

The Exploratory Factor Analysis Result of Personality

Item	Factor 1 (Neuroticism)	Factor 2 (Impulsivity: Lack of planning)	Factor 3 (Impulsivity: Sensation seeking)
I tend to be oversensitive and easily hurt by thoughtless remarks and actions of others	0.7077	0.0304	-0.1093
I often get emotionally upset	0.6910	-0.0370	-0.0084
I often feel uncomfortable and uneasy for no reason	0.6709	-0.0442	0.0398
I often think people I meet are better than I am	0.6622	-0.0100	0.0202
I often feel unsure of myself	0.6500	0.0487	0.0370
1 I am a very nervous person	0.6478	-0.0090	-0.0771
I often worry about things that other people think are not important	0.6391	0.0660	0.0305
I usually think about what I am going to do before doing it	0.0457	0.7731	-0.0292
Before I begin a complicated job, I make careful plans	0.0556	0.5926	0.0887
I often do things without thinking of the consequences	0.1254	-0.4970	0.3818
I like doing things just for the thrill of it	-0.0392	0.0183	0.7687
I sometimes like to do things that are a little frightening	-0.0785	-0.0461	0.6604
I enjoy getting into new situations where you can't tell how things will turn out	-0.0604	0.0231	0.5849
I like "wild parties"	-0.0065	-0.0321	0.5789
I prefer friends who are exciting and unpredictable	0.0285	0.0469	0.5669
I often get so carried away by new and exciting things and ideas that I never think of possible difficulties or problems	0.1184	-0.2757	0.4965
I would like the kind of life where I can travel a lot, with lots of change and excitement	0.0125	0.1943	0.4305

Appendix D

The Exploratory Factor Analysis Result of Coping

Item	Factor 1 (Problem solving)	Factor 2 (Distraction)	Factor 3 (Escape-Avoidance)
Try to analyze the problem and see how to make it better	0.7158	-0.0778	0.1385
Make a plan of action and follow it	0.5883	0.0813	0.0708
Try to keep emotions in control so you could think through options clearly	0.5402	0.2353	-0.1463
Seek advice from other people	0.4931	0.0016	0.1516
Do things to take your mind off the situation	0.0447	0.5881	0.0843
Try to keep a sense of humor	0.2725	0.5414	-0.1410
Try to look at the situation in a different way so it doesn't seem so bad	0.3273	0.5238	-0.0573
Try not to think about it at all	-0.1811	0.4944	0.0684
Accept that nothing can be done and try to move on	-0.1243	0.4728	0.0124
Keep your feelings to yourself to avoid embarrassment	-0.1712	0.4416	0.1776
Spend more time watching sad or angry movies or listening to sad music	-0.0495	-0.0493	0.6447
Let off some steam by going off on your own and yelling or crying	0.0262	-0.0439	0.6354
Daydream about how things used to be	0.1119	0.0826	0.6178
Go over the situation again and again in your mind	0.2567	-0.0977	0.5962
Have fantasies about how things will turn out	0.1517	0.0919	0.5665
Avoid being with people and spend lots of time alone	-0.1118	0.0596	0.5434
Get mad and break something or cause a scene	-0.2904	0.0678	0.4068

CURRICULUM VITAE

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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY
University of Washington	BA	05/09	Psychology; Communication
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Johns Hopkins University Bloomberg School of Public Health	PhD	05/15	Public Mental Health

Positions and Employment

2008-2009 Research Assistant, Department of Psychology, University of Washington
2009-2010 Research Assistant, Molecular Imaging and Neuropathology Division, New York State Psychiatric Institute
2009-2010 Community Outreach, Harlem United, New York, NY
2010-2011 Counselor, Aukela Christian Military Academy, Hollywood, FL
2011-2012 Research Assistant, Department of Mental Health, Johns Hopkins Bloomberg School of Public Health
2013- Research Assistant, Division of Child and Adolescent Psychiatry, Johns Hopkins Bayview Medical Center

Other Experience and Affiliations

2008-2009 Hotline Listener
2008- Student member, American Psychological Association
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2009-2011 Student member, Association for Behavioral and Cognitive Therapy
2014- Student member, American Public Health Association
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2014- Teaching Assistant, Department of Mental Health (Course: Social, Psychological, and Developmental Processes in the Etiology of Mental Disorders), Johns Hopkins Bloomberg School of Public Health

Honors

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Peer-Reviewed Publications

1. Lee-Winn AE, Tse Y, Luk J, & Holman G. A Facet-Level Analysis on the Associations Between Mindfulness and Attachment Styles. *Graduate Student Journal of Psychology*. 2010;12:31-36.
2. Lee-Winn AE, Mendelson T, & Mojtabai R. Racial/Ethnic Disparities in Binge Eating: Disorder Prevalence, Symptom Presentation, and Help-seeking Among Asian Americans and Non-Latino Whites. *American Journal of Public Health*. 2014;104(7);1263-1265.
3. Reinblatt SP, Mahone EM, Tanofsky-Kraff M, Lee-Winn AE, Yenokyan G, Leoutsakos, JS, Moran TH, Guarda AS, Riddle MA. Association Between Attention-Deficit/Hyperactivity Disorder (ADHD) & Loss of Control Eating (LOC) Among Children. *International Journal of Eating Disorders*. (In press).

Manuscripts In Preparation

1. Lee-Winn AE, Reinblatt SP, Mojtabai R, Mendelson T. Gender and Racial/Ethnic Differences in Prevalence and Symptoms of Binge Eating in a Nationally Representative Sample of Adolescents in the United States.
2. Lee-Winn AE, Townsend L, Reinblatt SP, Mendelson T. Associations of Neuroticism and Impulsivity with Binge Eating in a Nationally Representative Sample of Adolescents in the United States.
3. Lee-Winn AE, Townsend L, Reinblatt SP, Mendelson T. Associations among Neuroticism, Impulsivity, and Coping Styles with Binge Eating in a Nationally Representative Sample of Adolescents in the United States.
4. Lee-Winn AE, Mendelson T. Reward Sensitivity, Coping, and Emotional Eating in Urban Youth.
5. Reinblatt SP, Tanofsky-Kraff M, Lee-Winn AE, Yenokyan G, Guarda AS, Riddle MA. Association Between Hoarding Behavior and Loss of Control Eating Among Children.

Conference Poster Presentations

1. Lee-Winn AE, Tse Y, Luk J, & Holman G. A Facet-Level Analysis on the Associations Between Mindfulness and Attachment Styles. 2010 Association for Behavioral and Cognitive Therapy. San Francisco, CA.
2. Lee-Winn AE, Mendelson T, & Mojtabai R. Racial/Ethnic Disparities in Binge Eating: Disorder Prevalence, Symptom Presentation, and Help-seeking Among Asian Americans and Non-Latino Whites. 2013 American Psychopathological Association. New York, NY.
3. Reinblatt SP, Lee-Winn AE, Leoutsakos J, Coughlin JW, Tanofsky-Kraff M, Mahon M, & Riddle MA. Association Between Attention-Deficit/Hyperactivity Disorder (ADHD) & Loss of Control Eating (LOC) Among Children. 2013 Eating Disorders Research Society conference. Bethesda, MD.
4. Lee-Winn AE, Mendelson T. Coping Strategies and Binge Eating Disorder: Implications for Mindfulness-Based Approaches for Binge Eating Disorder. 2014 University of California, San Diego, Center for Mindfulness. San Diego, CA.
5. Lee-Winn AE, Mendelson T. Gender Differences in Prevalence and Symptom Presentation of Binge Eating Disorder Among the U.S. General Adolescent Population. 2014 Society for Prevention conference. Washington, DC. **Awarded the honorable mention in the 2014 Early Career Preventionists Network Student Poster Contest.*

6. Lee-Winn AE, Mendelson T. Impulsivity, Emotional Reactivity, and Disinhibition and as Common Correlates of Binge Eating Disorder and Alcohol Abuse: Implications for Mindfulness-Based Approaches. 2014 Mind and Life Summer Institute. Garrison, NY.
7. Lee-Winn AE, Mendelson T. (2014) Coping Strategies & Positive Affect: Implications for Mindfulness-Based Approaches to Emotional Well-Being. 2014 International Symposium of Contemplative Sciences. Boston, MA.
8. Lee-Winn AE, Mendelson T. (2014) Associations Between Personality Traits, Binge Eating Disorder, and Alcohol Abuse in the General U.S. Adolescent Population. 2014 American Public Health Association. New Orleans, LA.
9. Lee-Winn AE, Mendelson T. (2015) Is Coping a Potential Mediator of the Personality−Binge Eating Associations? A Nationally Representative Analysis of the U.S. Adolescent Sample. 2015 Society for Prevention conference. Washington, DC.

Abstracts of Selected Publications

Lee-Winn AE, Mendelson T, & Mojtabai R. Racial/Ethnic Disparities in Binge Eating: Disorder Prevalence, Symptom Presentation, and Help-seeking Among Asian Americans and Non-Latino Whites. *American Journal of Public Health*. 2014;104(7);1263-1265.

Asian Americans are more likely than non-Latino Whites to report binge eating, but are equally likely to meet binge eating disorder (BED) criteria. Using nationally representative data, we assessed whether differences in symptom reporting contributed to this disparity. Asian Americans were less likely than Whites to endorse BED symptoms related to distress or loss of control despite a higher prevalence of binge eating; they were also less likely to receive services for eating problems. Findings suggest cultural differences might lead to under-recognition of binge eating in Asian Americans.